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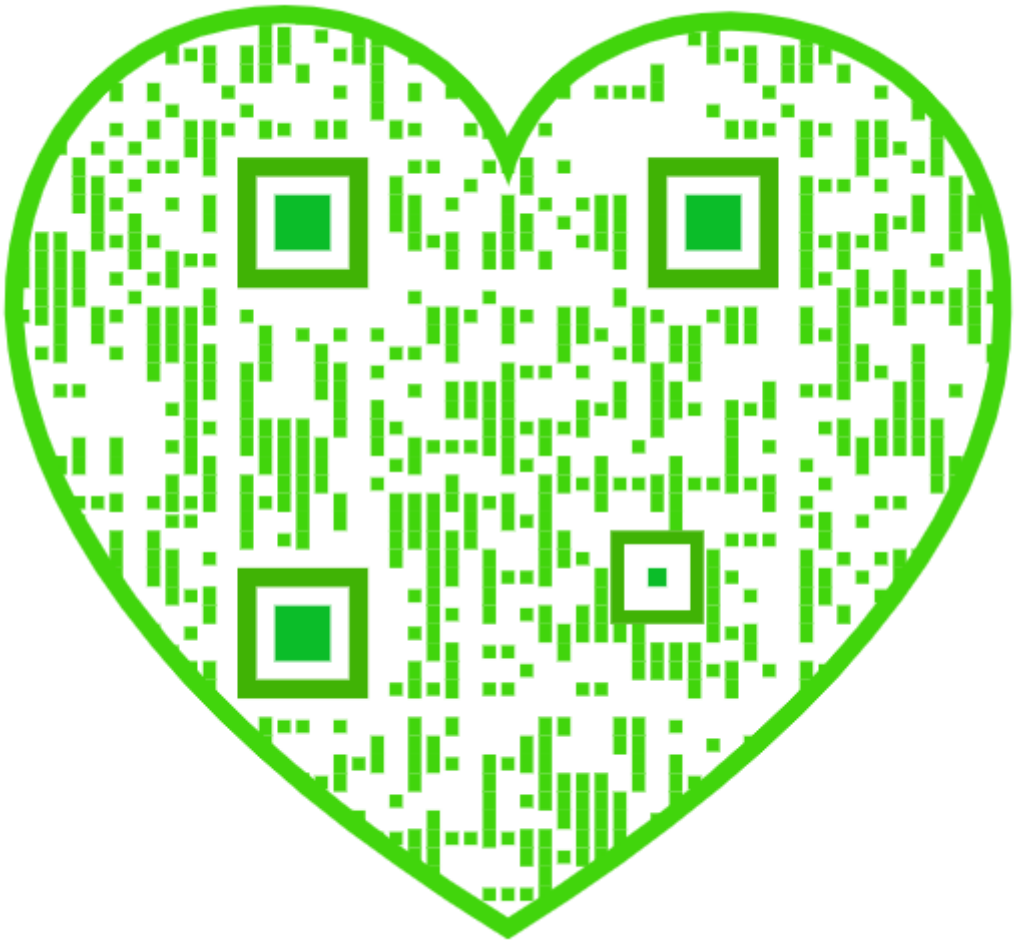

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STARS AND SEXTANTS

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STARS 1904 AND SEXTANTS

STAR DISTANCE TABLES

FOR FACILITATING THE USE OF

LORD ELLENBOROUGH'S METHOD OF CORRECTING THE CENTRING AND TOTAL ERRORS OF SEXTANTS AT SEA

BY

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AND

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PREFACE.

"STARS AND SEXTANTS" contains the necessary and sufficient material for determining, and determining with ease, the centring and total errors of a Sextant *at sea*.

It gives, for that purpose, all the angular distances between stars of the 2nd magnitude, or brighter, that are suitable for observation with a Sextant.

Hitherto the method of correcting Sextant errors by observation of Star Distances has been considered impracticable on account of the really complicated nature of an apparently simple problem. The complications are due to refraction and aberration, the latter being a source of error which has hitherto been quite neglected in practice, and has not even been exhaustively dealt with in theory.

In the present new and simple method these complications are avoided by—

(1) *Choosing, for the suitable time of observation, the time when the stars are on the same vertical great circle.*

In this case the refraction difficulty becomes simplified to mere addition and subtraction. This elegant simplification is due to Lord Ellenborough.

(2) *Making it practicable to ascertain this time.*

Thus, when two stars are on the same vertical great circle, the two imaginary stars 90° from each of them are obviously somewhere on the true horizon, one rising and the other setting. We therefore give data for determining with ease the time of rising of the proper "fictitious" star, a well-known and simple problem.

(3) *Restricting the selection of pairs of stars to the time of year when their respective distances are practically unaffected by aberration.*

For every pair of stars there are two instants in the year when aberration has no effect on the distance between them. Near these dates the effect is small, and in proportion to the nearness; and for a week on either side the effect is negligible. We have found these dates, and have classified the star pairs accordingly in the Ephemeris.

When no great accuracy is required, the distances as given in the Star Distance Section may be used at any time throughout the year; but when a higher degree of accuracy is considered desirable, the best pairs of stars to use on any day may be ascertained from the Ephemeris.

An important section of the book is the list of eighteen specially favourable star

pairs, the distances of which are given for every ten days throughout the year. They are certain to be found eminently serviceable by the traveller, the explorer, and the trigonometrical surveyor, as well as by the navigator for whom they are primarily intended.

It is to be hoped that this little treatise will be found a help in time of need by all who go down to the sea in ships, and that they will be enabled by its aid to do readily what has been regarded as for them impossible, viz., find the centring and total errors of their Sextants. The subject of centring error is one that has been too long neglected in actual practice: it deserves, on the contrary, the close attention of every careful navigator. So long, too, as the Sextant is used on board ship, it ought to be above reproach and as perfect as possible.

We leave the Introduction, with the explanation of the principles involved, and a description of the Tables and their use, to Lord Ellenborough, whose experience in the departments both of navigation and of nautical astronomy qualifies him to write on a matter to which he has devoted much thought, and to express opinions that he has verified by numerous observations.

THE AUTHORS.

November 1903.

INTRODUCTION.

TABLES

For facilitating the use of Lord Ellenborough's method of finding the centring and total errors of Sextants *at sea*, by Messrs SPRIGGE, DOAK, and HUDSON, of H.M. Nautical Almanac Office, and Mr COX.

STRANGE to say, though compasses are constantly being corrected both at sea and in harbour, and chronometers are perpetually being rated and checked by means of the sextant at sea, when passing well-known points of land, and also when in harbour, not one sextant in a thousand is ever completely corrected when once in the hands of the seaman. Yet it is as liable to accident as any other instrument.

The navigator can find the index error, but the centring error has hitherto been a mystery to him. If he has been wise enough to buy a sextant with a Kew certificate, that certificate cannot be permanently relied on. However careful he may be, he can never be absolutely certain that his sextant may not have received some injury.

The Admiralty do not permit a naval cadet to bring a sextant on board the "Britannia" unless it is provided with an "A" certificate from Kew. Besides other things, an "A" certificate means that the centring error is less than one minute. But what its centring error may have been at Kew, is no criterion as to what its centring error may be five years later. Who would think of buying a horse on the strength of a veterinary certificate given five years previously?

If the centring error of a sextant exceeds three minutes it is altogether rejected at Kew. It should be remembered, moreover, that the error due to three minutes, when occurring both in the sights taken at or near noon and also in those taken for longitude, may very frequently make a difference of ten miles in the supposed position of the ship.

The centring error of some sextants is considerable. In Staff Commander Martin's "Navigation," a sextant is referred to which was in actual use, whose centring error varied from nothing to ten minutes. Fifteen per cent. of the sextants rejected at Kew during "the years 1897, 1899, and 1900 were rejected on account of excessive error, or for other reasons." In the year 1900, 813 sextants were examined and 122 were rejected. Most of these sextants, with a possible three minute error, are probably now at sea, doubtless sold for a lower price than they would have fetched had they been able to obtain a proper certificate. Then, there are a number of sextants used in navigation that have never been near Kew.

Horizons are sometimes unreliable, but that is no reason why a sextant error should be added to an horizon error. At any rate, I do not suppose that any seaman

would venture to assert that a sextant can be too accurate, when employed for the purpose of finding the error and rate of a chronometer, by means of the artificial horizon. Opportunities for equal altitudes whereby the errors of the sextant are eliminated, do not occur as frequently as those for single altitudes. Surveying vessels may be able to stop in harbour until they obtain them. Other vessels cannot do so, and have often to rely on sets of single altitudes.

There is, however, one method of finding the error of a sextant when at sea, which is mentioned in some works on navigation. If the angular distance between two stars is observed and corrected for refraction, by means of a calculation similar to that of a lunar, the difference between the distance so corrected for refraction, and the true angular distance, will give the total error of the sextant. By applying the index error to this total error, the centring error can be found separately if it is desired to do so.

Now this method of correcting for refraction is so long and complicated, that I never heard of anyone who had actually used it. The late Captain S. F. R. Lecky, the well-known writer on navigation, describes it as "beyond the power of the navigator," and advises seamen to send their sextants to Kew to be corrected. The fee is six shillings, which must be sent with the sextant.

Two years ago, however, while watching the stars, I hit on a method which reduced this correction for refraction to simplicity itself. By restricting the observation to stars in line with the Zenith, *i.e.*, on the same Great Circle of altitude, these complicated calculations are reduced to simple addition and subtraction, and can be worked out in a minute or two. The two spherical triangles with a common angle disappear, and the whole of the work is done on a single line, a part of a Great Circle, just as in the case of a meridian altitude.

This corrected distance has to be compared with the actual or computed distance. Now this second computation is not beyond the powers of many navigators. But its calculation to seconds is outside the experience of by far the larger number of seamen actually employed in the navigation of British vessels. Even those who can calculate it, cannot wish to be wasting their time in calculation and recalculation of the angular distances of fixed stars. This can be very much better done, and more accurately done, once for all by practised astronomers on dry land. Lord Kelvin, who has done more for navigation than any other living man, has kindly given me permission to publish a letter he wrote to me on this point.

NETHERHALL, LARGS,
AYRSHIRE, *December* 4, 1902.

DEAR LORD ELLENBOROUGH,—Many thanks for your letter of November 30, and enclosed report of your speech in the House of Lords on correction of sextants, which I have read with much interest. I believe the addition to the Nautical Almanac which you ask for would be found valuable by many careful and zealous navigators. I quite agree with you that those who do take angular distances between pairs of stars nearly in a line with the Zenith, for the purpose of determining the errors of their sextants, ought to be spared the waste of time in making calculations, which can be "better done once for all by a single computer on dry land."—Yours truly,

(Signed) KELVIN.

It is clear, however, that my method will never come into general use afloat on board the class of vessels that are most in want of it, unless tables are published giving the angular distances of pairs of stars. This, I am glad to say, has now been undertaken by Messrs Sprigge, Doak, and Hudson, of H.M. Nautical Almanac Office, and Mr Cox.

These gentlemen, whose official position and experience in calculation ensure the accuracy of the Tables, have considerably improved on my original idea by adding some auxiliary data and tables, which enable the seaman to ascertain at what time certain pairs of stars are available. The navigator is thus relieved from the necessity of having to remain on deck watching the stars, and of trusting to the eye alone.

The only Table of Star Distances in existence is one calculated for twenty-seven pairs of stars, by the late Admiral Sir Charles Shadwell. I once had the honour of serving under him, and learnt a great deal from him. These pairs of stars were, however, not selected for the purpose of correcting sextants, but for finding the latitude by a method now obsolete. The last edition appeared in 1870.

There is no other known means of ascertaining the centring and total errors of a sextant *when at sea*, than the one I have mentioned, namely by angular distance of stars.

Formerly, a navigator who had the misfortune to have a sextant out of order, had to bring his ship home with a faulty sextant as best he could, perhaps from China or Australia, and run the risk of shipwreck on his way. In future, however, if he is provided with Messrs Sprigge, Doak, Hudson, and Cox's Tables, he can find his error at all angles on any starlight night. Next to being out of order, the worst thing that can happen to a sextant is for its owner to believe it out of order, and to consider it unreliable. He will probably make as bad a passage as the owner of the damaged sextant. Both will make bad landfalls, and in consequence lose time and *burn more coal*, a point to which I particularly wish to call the attention of shipowners.

The new method, accompanied by these tables, brings the "test for centring error *well within* the power of every navigator," and I hope that in time to come a sextant will be considered as incomplete when unaccompanied by the latest copy of these Tables, as it is now when without a Kew certificate.

ELLENBOROUGH,
Commander, Royal Navy
(Retired).

P.S.—Since going to press, my attention has been called to the article on the "Sextant," which is to be found at pages 26 and 27 of "Notes bearing on the Navigation of H.M. Ships," published by the Hydrographic Office, Admiralty.

It lays great stress on the importance of attending to the centring error of Sextants. I have, in consequence, reprinted the whole of it, as I can give no stronger proof of the necessity for these Tables.

EXTRACT FROM
"NOTES BEARING ON THE NAVIGATION OF H.M. SHIPS"

As printed for the Admiralty Hydrographic Office (pages 26 and 27).

SEXTANT.

Centring Error.—This important error of a sextant is much neglected.

Under this name are generally included all errors arising from the following:—

Eccentricity of the centre of the axis of the radius arm and the centre of the arc.

Faulty graduation.

Flexure of the frame of the instrument caused by varying temperature, or accidental blows.

These combine to make all angles measured with a sextant more or less erroneous, after the Index Error has been applied. The error may be small and unimportant. In a first-class instrument in perfect order it may not amount in any part of the arc to more than 10 seconds. On the other hand, in an inferior instrument, and after careless treatment, it may be as much as two or three minutes.

It is evident that this error, if unknown, may seriously affect the result of observations, especially those for time or longitude, and hence the necessity, when any accuracy is required, of observing in such a manner as to eliminate its effects.

For instance, if the error of a chronometer is obtained from sights on one side of the meridian alone, the result with a bad sextant may be several seconds in error. By taking equal altitudes, or by taking another set of single sights on the other side of the meridian (and in the latter case meaning the result of forenoon and afternoon sights), the effect of this error is eliminated, as the instrumental error has an opposite effect in the afternoon to that in the forenoon, and hence the result is correct, no matter what the amount of instrumental error may be.

In obtaining latitude by the sun, the error cannot be got rid of, unless the sun is high enough to permit its altitude to be taken to the opposite side of the horizon. For navigational purposes, however, the effect on latitude or longitude obtained at sea is not important, as it only affects that particular day, and is not cumulative.

It is otherwise with shore observations for rating a chronometer, which will be dealt with under "Rating."

The centring error is not easy to ascertain. It can be determined at Kew Observatory, where apparatus exists for the purpose, but the navigator can only find it by a series of artificial horizon observations in the following manner:—

Observe stars of nearly equal altitudes north and south of the zenith. Half the difference of the latitudes resulting from each star will be the centring error for that altitude. The correction will be *minus* if the latitude from the star on the polar side of the observer is greater than that from the star on the equatorial side, and *plus* if *vice versâ*.

As the centring error varies on different parts of the arc, and generally increases as the angle measured increases, it requires a considerable number of observations to determine it satisfactorily.

DESCRIPTION OF TABLES.

THESE tables give the angular distances between pairs of stars of the 1st and 2nd magnitudes, all of which are available for correcting sextants.

In consequence of aberration, the angular distance of some pairs of stars may vary as much as $35'' +$ or $35'' -$, during the course of the year.

If a sextant has met with an accident, and it is necessary to correct it immediately, any pair of stars to be found in the tables, at any time of year, will give the navigator the total error within $35''$, that is, within a little more than half a minute. This will enable him to bring his ship safely into harbour.

But if the seaman or the explorer wishes for greater accuracy, then he must note the time of the year, and only make use of stars within the limits laid down in the Ephemeris. The error due to aberration will, in that case, be always under $10''$. For the purpose of rating chronometers with the artificial horizon, I do not think that sextants can be too accurate, especially as the mariner has often to rely on sets of single altitudes which do not eliminate the error due to the sextant.

The time for taking the observation can generally be found by the eye, and by noting when the sextant is held perpendicularly in the hand. It is, however, better to look up the hour and approximate minute in the tables, where the position of an imaginary or "fictitious star" is laid down. This fictitious star is a pole of the Great Circle that the pair of stars are on, and when it is rising, the stars are in position. It may also happen (though not so frequently) that the stars are again in position when the "fictitious star" is *setting*.

The tables for refraction will be found more accurate and convenient than those now in use, as the corrections for barometer and thermometer are combined in one table. The arguments are apparent altitude and {Bar. (in.) $-\frac{1}{10}$ Therm. (deg. Fahr.) }.

Suppose Alt. 27°, Bar. 29 in., Therm. 60° F.

$29 - \frac{1}{10}(60) = 29 - 6 = 23$: then 27° and 23 give refraction $1' 48''$.

Suppose Alt. 45°, Bar. 30 in., Therm. 80° F.

$30 - \frac{1}{10}(80) = 30 - 8 = 22$: then 45° and 22 give refraction $0' 53''$.

The table of semidiurnal arcs is an extension and a simplification of the tables of time amplitudes, that are used for the purpose of ascertaining the time of the rising and of the setting of the sun. It gives the hour angle of the "fictitious star," when it is on the horizon, at one inspection and without calculation.

This table can also be used for finding the hour angle of any heavenly body when it is rising or setting. For instance, it gives the apparent time of sunset without any calculation. If the time of sunrise is required, subtract the time given from twelve hours.

When the sum of the latitude of the place, and of the declination of any real or fictitious star, exceeds 90°, then if their names are *alike*, the star will be circumpolar, and will not touch the horizon. If their names are *unlike*, it will not rise. The pairs corresponding to such fictitious stars cannot therefore be made use of in the latitude of the observer.

In practice, I have found that better contacts can be made with stars of about the same magnitude. Sirius and Canopus are too bright, whilst α Centauri, Procyon, and Arcturus have too large a proper motion. These five stars, therefore, have been intentionally omitted from these tables as being unsuitable for sextant observations.

As Capella and Rigel and a few other pairs of stars are on the meridian, or nearly so, when on a great circle of altitude, they are specially suitable for observation when in a close harbour. The latitude being known, the altitudes can be easily calculated. In their case no fictitious star is required. The time at which they are on the meridian should be found in the usual manner. When at sea, if the altitudes are taken, the latitude can be deduced from them if there is a good horizon.

As it is thought that these pairs of ex-meridian stars may be specially useful to surveyors or explorers, eighteen pairs of them have been placed in a separate table, and their distances have been calculated for every ten days. In the course of the year these star pairs will obviously be unavailable on certain dates owing to sunlight, but the determination of these may safely be left to the observer.

Whether above or below the Pole, the altitude of the Pole Star cannot change more than 5′·5 as long as it is within one hour and a half of the meridian; and if the altitude of the Pole Star is not less than 15°, a difference of 5′·5 will only affect the refraction to the extent of 1″. For these reasons, in the composition of this table, a freer use has been made of the Pole Star than of other stars.

The time at which the star paired with the Pole Star passes the meridian should be computed, and then, for the purposes of this observation, the Pole Star can be treated as if on the meridian. For instance, Spica is on the meridian within four minutes of the time that the Pole Star crosses the meridian below the Pole.

It is intended to revise the tables every five years or so.

ELLENBOROUGH,
Commander, Royal Navy
(Retired).

RULES FOR USING THE TABLES.

I. Choice of Pairs.

Refer to the Ephemeris for the date, and choose a pair or pairs given within

$$\left.\begin{matrix}7 \text{ days before} \\ 7 \text{ days after}\end{matrix}\right\} \text{that date, and}$$

consult the visible stars to make sure that they can be observed. If it is desired to check particular angles on the sextant, select pairs as near them as possible.

II. Data from Tables.

For any pair selected, turn up the Star Distance Table, by means of the page reference, and take out—

Distance.
R.A. and Dec. of Fictitious Star.

With the declination of the Fictitious Star and the latitude of ship, take out also the semidiurnal arc from the table on pages 42–45.

III. Time of Observation.

Subtract the semidiurnal arc from the R.A. of the Fictitious Star, to obtain the R.A. of meridian at observation. From this (adding 24^h if necessary) take the Sun's R.A. at preceding Greenwich Apparent Noon (*Nautical Almanac*, page I of the month). The result is *the rough ship apparent time of observation.*

If the time of observation is required to be within four minutes, apply to it the longitude in time (+ W, − E), and find the corresponding change in the Sun's R.A., which is to be *subtracted* from the rough time to get *the correct ship apparent time of observation.*

The time may be checked by means of Davis and Burdwood's "Sun and Star Azimuth Tables," or by corrected compass bearings. The azimuths of the two stars of the pair for the time of observation should either be the same or differ by 180°, according as the stars are on the same or opposite sides of the Zenith.

IV. Sextant Observation.

Set the sextant within a minute or two of the tabular distance. Take the distance and the altitudes of the two stars. Altitudes below 15° are not recommended.

If time presses, the altitude of one star is sufficient, for if the Zenith is between the stars, 180° − (altitude + distance) = altitude of other star. If both stars are on the same side of the Zenith, then (distance + altitude of lower star) = altitude of upper star.

V. True Sextant Distance.

Take out the refractions (pages 46–49), and add their difference to the observed distance if both stars are on the same side of the Zenith, and their sum if the Zenith is between the stars. The result is the *true sextant distance.* Its difference from the distance tabulated herein is the *total error*, *i.e.*, the sum of the index and centring errors.

The arguments for the Refraction Table are:—

(1) Barometer reading in inches, less one-tenth of the thermometer reading in degrees Fahrenheit.
(2) Observed altitude.

EXAMPLES.

A.—ZENITH BETWEEN STARS.

On December 2, in latitude about 48° 35′ N., longitude about $1^h\ 57^m$ W., to find the Centring Error at 72°.

Index Error, − 1′ 30″.
Barometer, 30 in.
Thermometer, 45° F.
Height above sea-level, 16 ft.

Take from Tables.

(Dec. 5): α **Ursæ Minoris** (*Polaris*) and α **Tauri** (*Aldebaran*).

(Page 24) { Distance, 72° 51′ 23″.
Fictitious star, R.A., $10^h\ 31^m$, Dec., 1° N.

(Page 42) Semidiurnal arc, $6^h\ 5^m$.

R.A. Fictitious Star - -	$10^h\ 31^m$
Semidiurnal Arc - - -	6 5
Diff. = R.A. of meridian at observation - - -	4 26
Sun's R.A. - - - -	16 33
Diff. = Rough apparent time ship for observation -	$11^h\ 53^m$

Rough time -	$11^h\ 53^m$
Longitude -	+ 1 57
Sum - - -	13 50
Correction to time (change in R.A.)	− 2
Correct A.T.S. for observation	$11^h\ 51^m$

	Polaris.	*Aldebaran.*
Observed altitude	49° 30′ 0″	57° 53′ 0″
Index correction -	− 1 30	− 1 30
	49 28 30	57 51 30
Dip - - -	4 0	4 0
Corrected altitude	49 24 30	57 47 30
Refraction - -	51″	37″
Sum of refractions	1′ 28″	

Observed distance	72° 52′ 24″
Sum of refractions	1 28
Sum - - -	72 53 52
Distance in table	72 51 23
Total error at 72°	− 2 29
Index error -	− 1 30
Centring error	− 0′ 59″

EXAMPLES.

B.—BOTH STARS ON THE SAME SIDE OF THE ZENITH.

On December 7, in latitude about 20° 39′ S., longitude about $0^h\ 47^m$ E., to find the Centring Error at 27°.

Index error, − 1′ 20″.
Barometer, 29 in.
Thermometer, 70° F.
Height above sea-level, 16 ft.

Take from Tables.

(Dec. 3): α **Tauri** (*Aldebaran*) and β **Orionis** (*Rigel*).

(Page 25) { Distance, 26° 29′ 54″.
Fictitious star, R.A., $10^h\ 56^m$, Dec., 22° N.

(Page 45) Semidiurnal arc, $5^h\ 25^m$.

R.A. Fictitious Star - -	$10^h\ 56^m$
Semidiurnal Arc - - -	5 25
Diff. = R.A. of meridian at observation - - -	5 31
Sun's R.A. - - - -	16 55
Diff. = Rough apparent time ship for observation -	$12^h\ 36^m$

Rough time -	$12^h\ 36^m$
Longitude - −	0 47
Sum - - -	11 49
Correction to time (change in R.A.)	− 2
Correct A.T.S. for observation	$12^h\ 34^m$

	Aldebaran.	*Rigel.*
Observed altitude -	50° 3′	76° 33′
Corrected altitude -	49 58	76 28
Refraction - - -	45″	14″
Difference of refractions	31″	

Observed distance	26° 29′ 31″
Difference of refractions - -	31
Sum - - -	26 30 2
Distance in table	26 29 54
Total error at 27°	− 0 8
Index error -	− 1 20
Centring error	+ 1′ 12″

b

RÈGLES POUR L'USAGE DES TABLES.

I. Pour choisir les paires d'Étoiles.

Prendre des éphémérides une paire d'étoiles donnée entre la période de sept jours avant et sept jours après la date, la paire devant être visible de la position où se trouve le navire. Si l'on veut vérifier certains angles du sextant, choisir une paire d'étoiles aussi près que possible de l'angle du sextant à vérifier.

II. Pour prendre les données des Tables.

Pour la paire d'étoiles choisie, chercher dans "Star Distance Table" avec l'aide de la référence des pages, et prendre—

Distance.
Ascension droite et déclinaison de l'étoile fictive ("Fictitious Star").

Avec la déclinaison de l'étoile fictive et la latitude du navire prendre aussi l'arc semi-diurne de la table se trouvant aux pages 42–45.

III. Pour trouver le temps d'Observation.

Soustraire l'arc semi-diurne de l'ascension droite de l'étoile fictive pour obtenir l'ascension droite du méridien à l'observation.

De cela prendre l'ascension droite du soleil au précédent midi du temps apparent de Paris (Connaissance des Temps).

Le résultat est le temps apparent approximatif du navire où se fait l'observation.

Si le temps d'observation est désiré en moins de quatre minutes, ajouter au temps approximatif trouvé le temps de longitude (+O, −E), et trouver le change correspondant dans l'ascension droite du soleil, lequel est à soustraire du temps approximatif pour obtenir le temps apparent corrigé du navire au moment de l'observation.

Le temps peut être vérifié au moyen de Davis et Burdwood's "Sun and Star Azimuth Tables" ou par le relèvement corrigé du compas. L'azimuth des deux étoiles de la paire au temps d'observation doit être la même ou différer de 180 degrés suivant que les étoiles sont du même ou du côté opposé du Zénith.

IV. Observation par le Sextant.

Ajuster le sextant à l'angle donné pour la paire d'étoiles. Prendre la distance

et les hauteurs des deux étoiles. Les hauteurs en dessous de 15° ne sont pas recommandées.

Si le temps pour faire l'observation manque, la hauteur d'une étoile suffit ; parceque si le Zénith est entre les deux étoiles, 180° – (hauteur + distance) = la hauteur de l'autre étoile : si les étoiles sont du même côté du Zénith, distance + hauteur de la plus basse étoile = la hauteur de la plus haute étoile.

V. Distance par le Sextant.

Prendre les réfractions des deux étoiles de la table et ajouter leur différence à la distance observée si les deux étoiles sont du même côté du Zénith et leur total si le Zénith est entre les deux étoiles. Le résultat est la distance vraie par le sextant. La différence entre cette distance et celle de la table est l'erreur totale, *i.e.*, la somme des erreurs de collimation et de l'eccentricité.

EXEMPLES.

A.—LE ZÉNITH ENTRE LES DEUX ÉTOILES.

Le 2 Décembre à la latitude 48° 35′ N., à peu près, et à la longitude 2^h 6^m O., à peu près, trouver l'erreur d'eccentricité à 72°.

Erreur de collimation, − 1′ 30″.
Baromètre, 0·762^m.
Thermomètre, +7°·2 Centigrade.
Élévation de l'œil, 4^m·9.

Prendre des Tables.

(Le 5 Décembre): *α* **Ursæ Minoris** (*Polaris*) et *α* **Tauri** (*Aldebaran*).

(Page 24) { Distance, 72° 51′ 23″.
Étoile fictive, R.A., 10^h 31^m, Dec., 1° N.

(Page 42) Arc semi-diurne, 6^h 5^m.

			Temps approximatif	11^h	53^m
Ascension droite de l'étoile fictive	10^h	31^m	Longitude	+ 2	6
Arc semi-diurne	6	5	Somme	13	59
Différence = Ascension droite du méridien	4	26	Correction au temps (change de l'ascension droite)	−	2
Ascension droite du soleil	16	33	Temps apparent corrigé du navire à l'instant de l'observation	11^h	51^m
Différence = Temps apparent approximatif du navire à l'instant de l'observation	11^h	53^m			

	Polaris.	*Aldebaran.*
Hauteur observée	49° 30′ 0″	57° 53′ 0″
Erreur de collimation	− 1 30	− 1 30
	49 28 30	57 51 30
Dépression	4 0	4 0
Hauteur corrigée	49 24 30	57 47 30
Réfraction	51″	37″
Somme des réfractions	1′ 28″	

Distance observée	72°	52′	24″
Somme des réfractions		1	28
Somme	72	53	52
Distance de la table	72	51	23
Erreur totale	−	2	29
Erreur de collimation	−	1	30
Erreur d'eccentricité	−	0′	59″

EXEMPLES.

B.—LES DEUX ÉTOILES DU MÊME CÔTÉ DU ZÉNITH.

Le 7 Décembre à la latitude 20° 39′ S., à peu près, et à la longitude $0^h\ 38^m$ E., à peu près, trouver l'erreur d'eccentricité à 27°.

Erreur de collimation, − 1′ 20″.
Baromètre, 0·737m.
Thermomètre, +21°·1 Centigrade.
Élévation de l'œil, $4^m{\cdot}9$.

Prendre des Tables.

(Le 3 Décembre) : *α* **Tauri** (*Aldebaran*) et *β* **Orionis** (*Rigel*).

(Page 25) { Distance, 26° 29′ 54″.
Étoile fictive, R.A., $10^h\ 56^m$, Dec., 22° N.

(Page 45) Arc semi-diurne, $5^h\ 25^m$.

Ascension droite de l'étoile fictive	$10^h\ 56^m$
Arc semi-diurne	5 25
Différence = Ascension droite du méridien	5 31
Ascension droite du soleil	16 55
Différence = Temps apparent approximatif du navire à l'instant de l'observation	$12^h\ 36^m$

Temps approximatif	$12^h\ 36^m$
Longitude	− 0 38
Somme	11 58
Correction au temps (change de l'ascension droite)	− 2
Temps apparent corrigé du navire à l'instant de l'observation	$12^h\ 34^m$

	Aldebaran.	*Rigel.*
Hauteur observée	50° 3′	76° 33′
Hauteur corrigée	49 58	76 28
Réfraction	45″	14″
Différence des réfractions	31″	

Distance observée	26° 29′ 31″
Différence des réfractions	31
Somme	26 30 2
Distance de la table	26 29 54
Erreur totale	− 0 8
Erreur de collimation	− 1 20
Erreur d'eccentricité	+ 1′ 12″

GEBRAUCHS-ANWEISUNG DER TAFELN.

I. Wahl der Stern-Paare.

Man wähle in der Ephemeride ein Paar Sterne zwischen—

7 Tage vor } dem Datum.
7 Tage nach }

Um die Fehler irgend eines Winkels des Sextanten herauszufinden, nimmt man die Paare, welche den nahe-liegendsten Winkel miteinander bilden.

II. Data aus den Tafeln.

Von der in der Ephemeride bezeichneten Seite der "Star Distance Table" nimmt man für das gewählte Paar:—

Distanz.
Rectascension und Declination des fingirten Sterns ("Fictitious Star").

Mit der Declination des fingirten Sterns und der Breite nimmt man ebenfalls den halben Tagbogen aus Seiten 42–45 der Tafel.

III. Beobachtungszeit.

Um die Rectascension des Meridians zu finden, zieht man den halben Tagbogen von der Rectascension des fingirten Sterns ab. Von dem Resultat zieht man die Rectascension der Sonne im vorgehenden Berlin—Mittage ab (Berliner Jahrbuch). Daraus ergiebt sich die annähernde wahre Beobachtungszeit auf dem Schiffe.

Falls die Beobachtungszeit bis zu 4 Minuten gewünscht ist, füge man zu dieser annähernden Beobachtungszeit die Länge (+W, −O) und finde man die in der Rectascension der Sonne correspondirenden Änderung, welche von der annähernden Zeit abzuziehen ist, um die gerade wahre Beobachtungszeit auf dem Schiffe zu finden.

Die Zeit kann geprüft werden durch Davis und Burdwood's "Sun and Star Azimuth Tables," oder durch eine verbesserte Peilung am Compass. Die Azimute der zwei Sterne des Paares für die Beobachtungszeit sollen entweder dieselben sein oder 180° differiren, je nachdem die Sterne sich an derselben Seite des Zeniths befinden, oder je ein Stern an jeder Seite.

IV. Sextant Beobachtung.

Man richte den Sextanten auf ungefähr ein oder zwei Minuten des in der Tafel

gegebenen Winkels. Man messe die Distanz und die Höhen der zwei Sterne. Die Höhen unter 15° sind nicht zu empfehlen.

Falls wenig Zeit vorhanden, ist die Höhe eines Sterns genügend; weil falls der Zenith zwischen den Sternen ist, 180° – (Höhe + Distanz) = Höhe des andern Sterns: wenn beide Sterne auf derselben Seite des Zeniths sind, Distanz + Höhe des niedrigeren Sterns = Höhe des höheren Sterns.

V. Sextant-Distanz.

Man suche die Refractionen aus der Tafel und füge ihre Differenz zu der beobachteten Distanz, falls beide Sterne auf derselben Seite des Zeniths sind und die Summe, wenn der Zenith zwischen den Sternen ist. Das Ergebniss ist die verbesserte Sextant-Distanz. Die Differenz von der in der Tafel gegebenen Distanz ist der totale Fehler, d.h. die Summe des collimations, und des Eccentricitäts-fehler.

BEISPIELE.

A.—ZENITH ZWISCHEN DEN STERNEN.

Am 2 December, Breite ca. 48° 35′ N., Länge ca. $2^h\ 51^m$ W., um den Eccentricitätsfehler am 72° zu finden.

Collimationsfehler, − 1′ 30″.
Barometer, 0·762m.
Termometer, +6° Réaumur.
Höhe überm Meeresspiegel, 16 Fuss.

Aus den Tafeln.

(Am 5 December): α **Ursæ Minoris** (*Polaris*) und α **Tauri** (*Aldebaran*).

(Page 24) { Distanz, 72° 51′ 23″.
Fingirter Stern, R.A., $10^h\ 31^m$, Dec., 1° N.

(Page 42) Halber Tagbogen, $6^h\ 5^m$.

Rectascension des fingirten Sterns	$10^h\ 31^m$	Annähernde Zeit	$11^h\ 53^m$
Halber Tagbogen	6 5	Länge +	2 51
		Summa	14 44
Differenz = Rectascension des Meridians	4 26	Correction zur Zeit (Änderung der Rectascension)	− 2
Rectascension der Sonne	16 33	Gerade wahre Beobachtungszeit auf dem Schiffe	$11^h\ 51^m$
Differenz = Annähernde wahre Beobachtungszeit auf dem Schiffe	$11^h\ 53^m$		

	Polaris.	*Aldebaran.*		
Beobachtete Höhe	49° 30′ 0″	57° 53′ 0″	Beobachtete Distanz	72° 52′ 24″
Collimationsfehler	− 1 30	− 1 30	Summa der Refractionen	1 28
	49 28 30	57 51 30	Summa	72 53 52
Duckung	4 0	4 0	Distanz aus der Tafel	72 51 23
Verbesserte Höhe	49 24 30	57 47 30	Totaler Fehler	− 2 29
Refraction	51″	37″	Collimationsfehler	− 1 30
Summa der Refractionen	1′ 28″		**Eccentricitätsfehler**	− 0′ 59″

BEISPIELE.

B.—DIE BEIDEN STERNE AN DERSELBEN SEITE DES ZENITHS.

Am 7 December, Breite ca. 20° 39′ S., Länge ca. $0^h\ 7^m$ W., um den Eccentricitätsfehler am 27° zu finden.

Collimationsfehler, − 1′ 20″.
Barometer, 0 737m.
Termometer, +17° Réaumur.
Höhe überm Meeresspiegel, 16 Fuss.

Aus den Tafeln.

(Am 3 December): α **Tauri** (*Aldebaran*) und β **Orionis** (*Rigel*).

(Page 25) { Distanz, 26° 29′ 54″.
{ Fingirter Stern, R.A., $10^h\ 56^m$, Dec., 22° N.

(Page 45) Halber Tagbogen, $5^h\ 25^m$.

Rectascension des fingirten Sterns	$10^h\ 56^m$
Halber Tagbogen	5 25
Differenz = Rectascension des Meridians	5 31
Rectascension der Sonne	16 55
Differenz = Annähernde wahre Beobachtungszeit auf dem Schiffe	$12^h\ 36^m$

Annähernde Zeit	$12^h\ 36^m$
Länge	+ 0 7
Summa	12 43
Correction zur Zeit (Änderung der Rectascension)	− 2
Gerade wahre Beobachtungszeit auf dem Schiffe	$12^h\ 34^m$

	Aldebaran.	*Rigel.*
Beobachtete Höhe	50° 3′	76° 33′
Verbesserte Höhe	49 58	76 28
Refraction	45″	14″
Differenz der Refractionen	31″	

Beobachtete Distanz	26° 29′ 31″
Differenz der Refractionen	31
Summa	26 30 2
Distanz aus der Tafel	26 29 54
Totaler Fehler	− 0 8
Collimationsfehler	− 1 20
Eccentricitätsfehler	+ 1′ 12″

EPHEMERIS, 1904.

Date.	Distance available between	Star Pair. Names.	Mags.	Approximate Distance.	Page.
Jan. 1	Dec. 25 and Jan. 8	α **Ursæ Minoris** : δ Canis Majoris	2·1 : 2·0	116°	24
		γ Orionis : δ Argûs	1·7 : 2·0	74	26
		γ Orionis : α Ursæ Majoris	1·7 : 2·0	82	26
		β Tauri : δ Argûs	1·8 : 2·0	94	26
		β Tauri : α Ursæ Majoris	1·8 : 2·0	62	26
		ζ Orionis : β Argûs	2·0 : 1·7	76	26
		β Canis Majoris : ε Canis Majoris	2·0 : 1·6	14	27
Jan. 2	Dec. 26 and Jan. 9	α **Ursæ Minoris** : α Geminorum	2·1 : 2·0	58	24
		α Tauri : η Ursæ Majoris	1·1 : 1·9	104	25
		α Aurigæ : δ Argûs	0·2 : 2·0	110	25
		α Aurigæ : α Ursæ Majoris	0·2 : 2·0	49	25
		ε Orionis : α Ursæ Majoris	1·7 : 2·0	87	26
		ζ Orionis : γ Argûs	2·0 : 1·9	56	26
		ζ Orionis : δ Argûs	2·0 : 2·0	65	26
		β Canis Majoris : δ Canis Majoris	2·0 : 2·0	14	27
		γ Geminorum : ε Canis Majoris	1·9 : 1·6	46	27
		γ Geminorum : α Geminorum	1·9 : 2·0	20	27
Jan. 3	Dec. 27 and Jan. 10	ζ Orionis : α Ursæ Majoris	2·0 : 2·0	87	26
		α Orionis : ε Argûs	1·0–1·4 : 1·7	73	27
		α Orionis : α Trianguli Australis	1·0–1·4 : 1·9	117	27
		β Canis Majoris : α Geminorum	2·0 : 2·0	53	27
		γ Geminorum : δ Canis Majoris	1·9 : 2·0	43	27
Jan. 4	Dec. 28 and Jan. 11	ε Orionis : δ Argûs	1·7 : 2·0	66	26
		α Orionis : γ Argûs	1·0–1·4 : 1·9	62	27
		α Orionis : β Argûs	1·0–1·4 : 1·7	84	27
		β Canis Majoris : β Geminorum	2·0 : 1·2	50	27
		γ Geminorum : β Geminorum	1·9 : 1·2	19	27
Jan. 5	Dec. 29 and Jan. 12	α **Ursæ Minoris** : β Geminorum	2·1 : 1·2	62	24
		α Orionis : α Ursæ Majoris	1·0–1·4 : 2·0	77	27
Jan. 7	Dec. 31 and Jan. 14	α Tauri : γ Crucis	1·1 : 1·6	119	25
		β Orionis : ε Ursæ Majoris	0·3 : 1·8	111	25
		β Tauri : ε Ursæ Majoris	1·8 : 1·8	78	26
		α Orionis : δ Argûs	1·0–1·4 : 2·0	71	27
Jan. 8	Jan. 1 and Jan. 15	α Eridani : θ Scorpii	0·5 : 2·0	68	24
		α Persei : α Leonis	1·9 : 1·3	88	24
		α Tauri : α Leonis	1·1 : 1·3	80	25

Look in Star Distance List for the 1st Star of the pair in bold type.

EPHEMERIS, 1904.

Date.	Distance available between	Star Pair. Names.	Mags.	Approximate Distance.	Page.
Jan. 8	Jan. 1 and Jan. 15	α Aurigæ : ε Ursæ Majoris.....	0·2 : 1·8	64	25
		γ Orionis : ε Ursæ Majoris.....	1·7 : 1·8	97	26
		ε Canis Majoris : α Geminorum...	1·6 : 2·0	61	27
Jan. 9	Jan. 2 and Jan. 16	δ Canis Majoris : α Geminorum ...	2·0 : 2·0	59	28
Jan. 10	Jan. 3 and Jan. 17	ε Orionis : ε Ursæ Majoris	1·7 : 1·8	102	26
		ζ Orionis : ε Ursæ Majoris.....	2·0 : 1·8	102	27
		ε Canis Majoris : δ Canis Majoris	1·6 : 2·0	3	27
		ε Canis Majoris : β Geminorum...	1·6 : 1·2	58	27
		α Geminorum : β Geminorum.....	2·0 : 1·2	5	28
Jan. 11	Jan. 4 and Jan. 18	γ Geminorum : γ Argûs.....	1·9 : 1·9	67	27
		γ Geminorum : α Ursæ Majoris...	1·9 : 2·0	65	27
		δ Canis Majoris : β Geminorum...	2·0 : 1·2	55	28
Jan. 12	Jan. 5 and Jan. 19	β Tauri : η Ursæ Majoris	1·8 : 1·9	88	26
		α Orionis : ε Ursæ Majoris.....	1·0–1·4 : 1·8	92	27
		γ Geminorum : ε Argûs.....	1·9 : 1·7	79	27
		α Geminorum : α Lyræ.....	2·0 : 0·1	108	28
Jan. 13	Jan. 6 and Jan. 20	γ Orionis : η Ursæ Majoris	1·7 : 1·9	107	26
		β Canis Majoris : α Ursæ Majoris	2·0 : 2·0	97	27
Jan. 14	Jan. 7 and Jan. 21	α Aurigæ : η Ursæ Majoris.....	0·2 : 1·9	74	25
		β Canis Majoris : γ Argûs.....	2·0 : 1·9	37	27
		γ Geminorum : β Argûs.....	1·9 : 1·7	90	27
Jan. 15	Jan. 8 and Jan. 22	α Eridani : ε Sagittarii.....	0·5 : 1·9	70	24
		β Orionis : α Leonis.....	0·3 : 1·3	76	25
		γ Orionis : α Leonis.....	1·7 : 1·3	70	26
		β Tauri : α Leonis.....	1·8 : 1·3	67	26
		ε Orionis : η Ursæ Majoris.....	1·7 : 1·9	112	26
		β Canis Majoris : ε Argûs.....	2·0 : 1·7	47	27
		γ Geminorum : δ Argûs.....	1·9 : 2·0	76	27
Jan. 16	Jan. 9 and Jan. 23	α **Ursæ Minoris** : α Ursæ Majoris	2·1 : 2·0	29	24
		α Aurigæ : α Leonis	0·2 : 1·3	70	25
		ε Orionis : α Leonis.....	1·7 : 1·3	69	26
		ζ Orionis : η Ursæ Majoris.....	2·0 : 1·9	112	27

Look in Star Distance List for the 1st Star of the pair in bold type.

EPHEMERIS, 1904.

Date.	Distance available between	Star Pair. Names.	Mags.	Approximate Distance.	Page.
Jan. 17	Jan. 10 and Jan. 24	ζ Orionis : α Leonis	2·0 : 1·3	68°	26
Jan. 18	Jan. 11 and Jan. 25	β Orionis : α Crucis	0·3 : 1·0	91	25
		γ Orionis : α Crucis	1·7 : 1·0	103	26
		α Orionis : α Leonis	1·0–1·4 : 1·3	62	27
		α Orionis : η Ursæ Majoris	1·0–1·4 : 1·9	102	27
		α Geminorum : α Ursæ Majoris	2·0 : 2·0	45	28
Jan. 19	Jan. 12 and Jan. 26	β Canis Majoris : δ Argûs	2·0 : 2·0	46	27
		γ Geminorum : ε Ursæ Majoris	1·9 : 1·8	79	27
		α Geminorum : γ Argûs	2·0 : 1·9	80	28
Jan. 20	Jan. 13 and Jan. 27	β Canis Majoris : β Argûs	2·0 : 1·7	58	27
		β Geminorum : α Ursæ Majoris	1·2 : 2·0	47	28
		β Geminorum : α Lyræ	1·2 : 0·1	111	28
Jan. 21	Jan. 14 and Jan. 28	ε Canis Majoris : α Ursæ Majoris	1·6 : 2·0	103	28
		α Geminorum : ε Argûs	2·0 : 1·7	92	28
		β Geminorum : γ Argûs	1·2 : 1·9	76	28
Jan. 22	Jan. 15 and Jan. 29	ε Orionis : α Crucis	1·7 : 1·0	95	26
		β Canis Majoris : ε Ursæ Majoris	2·0 : 1·8	109	27
		δ Canis Majoris : α Ursæ Majoris	2·0 : 2·0	100	28
Jan. 23	Jan. 16 and Jan. 30	γ Orionis : β Crucis	1·7 : 1·5	106	26
		γ Geminorum : α Leonis	1·9 : 1·3	51	27
		ε Canis Majoris : γ Argûs	1·6 : 1·9	23	27
Jan. 24	Jan. 17 and Jan. 31	γ Orionis : γ Crucis	1·7 : 1·6	104	26
		α Geminorum : δ Argûs	2·0 : 2·0	88	28
		β Geminorum : ε Argûs	1·2 : 1·7	88	28
Jan. 25	Jan. 18 and Feb. 1	β Orionis : γ Crucis	0·3 : 1·6	93	25
		β Orionis : β Crucis	0·3 : 1·5	94	25
		ζ Orionis : α Crucis	2·0 : 1·0	93	26
		α Orionis : α Crucis	1·0–1·4 : 1·0	100	27
		γ Geminorum : η Ursæ Majoris	1·9 : 1·9	88	27
		δ Canis Majoris : γ Argûs	2·0 : 1·9	24	28
		α Geminorum : β Argûs	2·0 : 1·7	103	28

Look in Star Distance List for the 1st Star of the pair in bold type.

EPHEMERIS, 1904.

Date.	Distance available between	Star Pair. Names.	Mags.	Approximate Distance.	Page.
				°	
Jan. 26	Jan. 19 and Feb. 2	γ Orionis : β Centauri	1·7 : 0·8	114	26
		β Canis Majoris : α Leonis	2·0 : 1·3	63	27
		α Geminorum : ε Ursæ Majoris	2·0 : 1·8	59	28
		β Geminorum : δ Argûs	1·2 : 2·0	84	28
Jan. 28	Jan. 21 and Feb. 4	α Eridani : β Argûs	0·5 : 1·7	45	24
		ε Canis Majoris : ε Argûs	1·6 : 1·7	34	27
		α Geminorum : α Leonis	2·0 : 1·3	41	28
		β Geminorum : β Argûs	1·2 : 1·7	99	28
		β Geminorum : ε Ursæ Majoris	1·2 : 1·8	60	28
Jan. 29	Jan. 22 and Feb. 5	α **Ursæ Minoris** : ε Ursæ Majoris	2·1 : 1·8	35	38
		ε Orionis : γ Crucis	1·7 : 1·6	96	26
		ε Orionis : β Crucis	1·7 : 1·5	98	26
		δ Canis Majoris : ε Argûs	2·0 : 1·7	36	28
		β Geminorum : α Leonis	1·2 : 1·3	37	28
Jan. 30	Jan. 23 and Feb. 6	ζ Orionis : β Crucis	2·0 : 1·5	97	27
		α Orionis : γ Crucis	1·0–1·4 : 1·6	101	27
		α Orionis : β Crucis	1·0–1·4 : 1·5	103	27
		β Canis Majoris : η Ursæ Majoris	2·0 : 1·9	117	27
		ε Canis Majoris : δ Argûs	1·6 : 2·0	32	28
Jan. 31	Jan. 24 and Feb. 7	α **Ursæ Minoris** : α Leonis	2·1 : 1·3	78	24
		ζ Orionis : γ Crucis	2·0 : 1·6	95	26
Feb. 1	Jan. 25 and Feb. 8	β Orionis : β Centauri	0·3 : 0·8	102	25
		δ Canis Majoris : δ Argûs	2·0 : 2·0	33	28
		α Geminorum : η Ursæ Majoris	2·0 : 1·9	68	28
Feb. 2	Jan. 26 and Feb. 9	ε Orionis : β Centauri	1·7 : 0·8	106	26
		ε Canis Majoris : α Leonis	1·6 : 1·3	61	28
		ε Canis Majoris : ε Ursæ Majoris	1·6 : 1·8	113	28
		δ Canis Majoris : ε Ursæ Majoris	2·0 : 1·8	110	28
Feb. 3	Jan. 27 and Feb. 10	γ Geminorum : α Crucis	1·9 : 1·0	103	27
		δ Canis Majoris : α Leonis	2·0 : 1·3	58	28
		β Geminorum : η Ursæ Majoris	1·2 : 1·9	69	28

Look in Star Distance List for the 1st Star of the pair in bold type.

EPHEMERIS, 1904.

Date.	Distance available between	Star Pair. Names.	Mags.	Approximate Distance.	Page.
Feb. 4	Jan. 28 and Feb. 11	ζ Orionis : β Centauri	2·0 : 0·8	105	27
		α Orionis : β Centauri	1·0–1·4 : 0·8	112	27
Feb. 5	Jan. 29 and Feb. 12	α Eridani : α Leonis	0·5 : 1·3	120	24
Feb. 6	Jan. 30 and Feb. 13	ε Canis Majoris : β Argûs	1·6 : 1·7	45	28
Feb. 7	Jan. 31 and Feb. 14	γ Geminorum : γ Crucis	1·9 : 1·6	103	27
		γ Geminorum : β Crucis	1·9 : 1·5	105	27
		δ Canis Majoris : β Argûs	2·0 : 1·7	47	28
Feb. 8	Feb. 1 and Feb. 15	γ Argûs : α Ursæ Majoris	1·9 : 2·0	115	28
Feb. 9	Feb. 2 and Feb. 16	α **Ursæ Minoris** : η Ursæ Majoris	2·1 : 1·9	41	39
		ε Canis Majoris : η Ursæ Majoris	1·6 : 1·9	119	28
Feb. 10	Feb. 3 and Feb. 17	δ Canis Majoris : η Ursæ Majoris.	2·0 : 1·9	116	28
Feb. 11	Feb. 4 and Feb. 18	α Leonis : α Ursæ Majoris	1·3 : 2·0	51	29
Feb. 12	Feb. 5 and Feb. 19	γ Geminorum : β Centauri	1·9 : 0·8	115	27
		α Ursæ Majoris : ε Ursæ Majoris.	2·0 : 1·8	15	30
Feb. 13	Feb. 6 and Feb. 20	α Geminorum : α Crucis	2·0 : 1·0	111	28
Feb. 14	Feb. 7 and Feb. 21	α Leonis : α Cygni	1·3 : 1·3	119	29
Feb. 15	Feb. 8 and Feb. 22	α Orionis : α Virginis	1·0–1·4 : 1·2	113	27
		β Geminorum : α Crucis	1·2 : 1·0	107	28
		δ Argûs : α Ursæ Majoris	2·0 : 2·0	120	29
Feb. 16	Feb. 9 and Feb. 23	ε Orionis : α Virginis	1·7 : 1·2	116	26
		ζ Orionis : α Virginis	2·0 : 1·2	115	27
		β Canis Majoris : α Crucis	2·0 : 1·0	74	27
		α Geminorum : γ Crucis	2·0 : 1·6	109	28
		γ Argûs : α Leonis	1·9 : 1·3	65	28

Look in Star Distance List for the 1st Star of the pair in bold type.

EPHEMERIS, 1904.

Date.	Distance available between	Star Pair. Names.	Mags.	Approximate Distance.	Page.
				°	
Feb. 17	Feb. 10 and Feb. 24	α Eridani : δ Argûs	0·5 : 2·0	53	24
		β Orionis : α Virginis	0·3 : 1·2	120	25
		α Geminorum : β Crucis	2·0 : 1·5	112	28
		β Geminorum : γ Crucis	1·2 : 1·6	104	28
Feb. 18	Feb. 11 and Feb. 25	β Geminorum : β Crucis	1·2 : 1·5	107	28
Feb. 19	Feb. 12 and Feb. 26	α Eridani : ε Argûs	0·5 : 1·7	48	24
		β Canis Majoris : γ Crucis	2·0 : 1·6	76	27
		γ Geminorum : α Virginis	1·9 : 1·2	104	27
Feb. 20	Feb. 13 and Feb. 27	β Canis Majoris : β Crucis	2·0 : 1·5	78	27
		α Leonis : ε Ursæ Majoris	1·3 : 1·8	54	29
Feb. 22	Feb. 15 and Feb. 29	γ Argûs : ε Ursæ Majoris	1·9 : 1·8	119	29
		ε Argûs : α Leonis	1·7 : 1·3	75	29
		δ Argûs : α Leonis	2·0 : 1·3	69	29
		α Ursæ Majoris : η Ursæ Majoris	2·0 : 1·9	26	30
Feb. 24	Feb. 17 and Mar. 2	β Geminorum : β Centauri	1·2 : 0·8	116	28
Feb. 25	Feb. 18 and Mar. 3	α Geminorum : α Virginis	2·0 : 1·2	94	28
Feb. 26	Feb. 19 and Mar. 4	β Geminorum : α Virginis	1·2 : 1·2	91	28
		γ Argûs : ε Argûs	1·9 : 1·7	12	28
		γ Argûs : δ Argûs	1·9 : 2·0	9	28
Feb. 27	Feb. 20 and Mar. 5	α **Ursæ Minoris** : α Lyræ	2·1 : 0·1	52	24
		α Leonis : η Ursæ Majoris	1·3 : 1·9	58	29
Mar. 1	Feb. 23 and Mar. 8	β Canis Majoris : α Virginis	2·0 : 1·2	101	27
Mar. 2	Feb. 24 and Mar. 9	β Canis Majoris : β Centauri	2·0 : 0·8	86	27
		β Argûs : α Leonis	1·7 : 1·3	82	29
Mar. 3	Feb. 25 and Mar. 10	δ Canis Majoris : α Crucis	2·0 : 1·0	62	28

Look in Star Distance List for the 1st Star of the pair in bold type.

EPHEMERIS, 1904.

Date.	Distance available between	Star Pair. Names.	Mags.	Approximate Distance.	Page.
Mar. 4	Feb. 26 and Mar. 11	ϵ Canis Majoris : α Crucis	1·6 : 1·0	61′	28
		δ Canis Majoris : γ Crucis	2·0 : 1·6	63	28
Mar. 5	Feb. 27 and Mar. 12	β Canis Majoris : α Trianguli Aust	2·0 : 1·9	91	27
		ϵ Ursæ Majoris : η Ursæ Majoris	1·8 : 1·9	10	30
Mar. 6	Feb. 28 and Mar. 13	ϵ Canis Majoris : γ Crucis	1·6 : 1·6	62	28
Mar. 7	Feb. 29 and Mar. 14	ϵ Canis Majoris : β Crucis	1·6 : 1·5	64	28
		δ Canis Majoris : β Crucis	2·0 : 1·5	65	28
Mar. 9	Mar. 2 and Mar. 16	ϵ Canis Majoris : α Virginis	1·6 : 1·2	90	28
Mar. 10	Mar. 3 and Mar. 17	δ Canis Majoris : α Virginis	2·0 : 1·2	89	28
		ϵ Argûs : δ Argûs	1·7 : 2·0	6	29
Mar. 13	Mar. 6 and Mar. 20	γ Argûs : β Argûs	1·9 : 1·7	24	28
Mar. 15	Mar. 8 and Mar. 22	α Leonis : α Crucis	1·3 : 1·0	80	29
		α Leonis : γ Crucis	1·3 : 1·6	75	29
Mar. 16	Mar. 9 and Mar. 23	α Leonis : β Crucis	1·3 : 1·5	78	29
		α Leonis : α Virginis	1·3 : 1·2	54	29
		α Leonis : α Lyræ	1·3 : 0·1	109	29
Mar. 17	Mar. 10 and Mar. 24	δ Canis Majoris : β Centauri	2·0 : 0·8	74	28
		α Ursæ Majoris : α Virginis	2·0 : 1·2	78	30
Mar. 18	Mar. 11 and Mar. 25	α **Ursæ Minoris** : α Virginis	2·1 : 1·2	102	38
		ϵ Canis Majoris : β Centauri	1·6 : 0·8	73	28
Mar. 22	Mar. 15 and Mar. 29	α Leonis : β Centauri	1·3 : 0·8	86	29
Mar. 26	Mar. 19 and Apr. 2	ϵ Ursæ Majoris : α Virginis	1·8 : 1·2	67	30

Look in Star Distance List for the 1st Star of the pair in bold type.

EPHEMERIS, 1904.

Date.	Distance available between	Star Pair. Names.	Mags.	Approximate Distance.	Page.
Mar. 27	Mar. 20 and Apr. 3	γ Argûs : α Virginis	1·9 : 1·2	74°	29
Mar. 28	Mar. 21 and Apr. 4	δ Argûs : β Argûs	2·0 : 1·7	15	29
Mar. 29	Mar. 22 and Apr. 5	α Leonis : α Trianguli Australis	1·3 : 1·9	105	29
		α Crucis : ε Ursæ Majoris	1·0 : 1·8	119	30
		γ Crucis : ε Ursæ Majoris	1·6 : 1·8	113	30
Mar. 30	Mar. 23 and Apr. 6	γ Argûs : γ Crucis	1·9 : 1·6	40	29
Mar. 31	Mar. 24 and Apr. 7	δ Canis Majoris : α Trianguli Aust.	2·0 : 1·9	81	28
		γ Argûs : α Crucis	1·9 : 1·0	38	29
		β Crucis : ε Ursæ Majoris	1·5 : 1·8	116	30
Apr. 1	Mar. 25 and Apr. 8	γ Argûs : β Crucis	1·9 : 1·5	41	29
		δ Argûs : α Virginis	2·0 : 1·2	69	29
		α Virginis : η Ursæ Majoris	1·2 : 1·9	61	30
Apr. 3	Mar. 27 and Apr. 10	ε Argûs : β Argûs	1·7 : 1·7	12	29
Apr. 4	Mar. 28 and Apr. 11	ε Argûs : α Virginis	1·7 : 1·2	73	29
Apr. 5	Mar. 29 and Apr. 12	ε Canis Majoris : α Trianguli Aust.	1·6 : 1·9	79	28
		γ Crucis : η Ursæ Majoris	1·6 : 1·9	108	30
Apr. 7	Mar. 31 and Apr. 14	δ Argûs : γ Crucis	2·0 : 1·6	31	29
		β Crucis : η Ursæ Majoris	1·5 : 1·9	110	30
Apr. 8	Apr. 1 and Apr. 15	δ Argûs : α Crucis	2·0 : 1·0	29	29
		α Leonis : α Scorpii	1·3 : 1·3	100	29
		α Crucis : η Ursæ Majoris	1·0 : 1·9	114	30
Apr. 10	Apr. 3 and Apr. 17	δ Argûs : β Crucis	2·0 : 1·5	32	29
		ε Ursæ Majoris : β Centauri	1·8 : 0·8	117	30
Apr. 12	Apr. 5 and Apr. 19	α **Ursæ Minoris** : α Cygni	2·1 : 1·3	45	24
		ε Argûs : γ Crucis	1·7 : 1·6	32	29

Look in Star Distance List for the 1st Star of the pair in bold type.

EPHEMERIS, 1904.

Date.	Distance available between	Star Pair. Names.	Mags.	Approximate Distance.	Page.
Apr. 13	Apr. 6 and Apr. 20	γ Argûs : β Centauri	1·9 : 0·8	50	29
		α Leonis : θ Scorpii	1·3 : 2·0	114	29
Apr. 14	Apr. 7 and Apr. 21	β Argûs : α Virginis	1·7 : 1·2	70	29
		α Leonis : λ Scorpii	1·3 : 1·8	114	29
Apr. 15	Apr. 8 and Apr. 22	ε Argûs : β Crucis	1·7 : 1·5	32	29
Apr. 16	Apr. 9 and Apr. 23	ε Argûs : α Crucis	1·7 : 1·0	28	29
		η Ursæ Majoris : β Centauri	1·9 : 0·8	110	31
Apr. 17	Apr. 10 and Apr. 24	δ Canis Majoris : α Scorpii	2·0 : 1·3	115	28
		γ Crucis : α Virginis	1·6 : 1·2	47	30
Apr. 18	Apr. 11 and Apr. 25	α Ursæ Majoris : α Scorpii	2·0 : 1·3	109	30
		β Crucis : α Virginis	1·5 : 1·2	49	30
		ε Ursæ Majoris : α Lyræ	1·8 : 0·1	57	30
Apr. 19	Apr. 12 and Apr. 26	δ Argûs : β Centauri	2·0 : 0·8	41	29
Apr. 20	Apr. 13 and Apr. 27	ε Canis Majoris : α Scorpii	1·6 : 1·3	114	28
		α Crucis : α Virginis	1·0 : 1·2	53	30
Apr. 24	Apr. 17 and May 1	β Argûs : γ Crucis	1·7 : 1·6	25	29
Apr. 25	Apr. 18 and May 2	β Argûs : α Crucis	1·7 : 1·0	20	29
		α Virginis : β Centauri	1·2 : 0·8	50	30
Apr. 26	Apr. 19 and May 3	ε Argûs : β Centauri	1·7 : 0·8	40	29
		β Argûs : β Crucis	1·7 : 1·5	24	29
Apr. 27	Apr. 20 and May 4	γ Crucis : β Crucis	1·6 : 1·5	3	30
		ε Ursæ Majoris : α Scorpii	1·8 : 1·3	94	30

Look in Star Distance List for the 1st Star of the pair in bold type.

EPHEMERIS, 1904.

Date.	Distance available between	Star Pair. Names.	Mags.	Approximate Distance.	Page.
Apr. 28	Apr. 21 and May 5	α Crucis : γ Crucis	1·0 : 1·6	6°	30
Apr. 30	Apr. 23 and May 7	α Crucis : β Crucis	1·0 : 1·5	4	30
May 1	Apr. 24 and May 8	δ Canis Majoris : θ Scorpii	2·0 : 2·0	108	28
		η Ursæ Majoris : α Scorpii	1·9 : 1·3	84	31
		η Ursæ Majoris : α Lyræ	1·9 : 0·1	51	31
May 2	Apr. 25 and May 9	γ Argûs : α Scorpii	1·9 : 1·3	91	29
		γ Argûs : α Trianguli Australis	1·9 : 1·9	58	29
May 3	Apr. 26 and May 10	δ Canis Majoris : λ Scorpii	2·0 : 1·8	113	28
		γ Crucis : β Centauri	1·6 : 0·8	12	30
May 6	Apr. 29 and May 13	β Argûs : β Centauri	1·7 : 0·8	30	29
		β Crucis : β Centauri	1·5 : 0·8	9	30
		α Virginis : α Scorpii	1·2 : 1·3	46	30
		α Virginis : α Trianguli Australis	1·2 : 1·9	66	30
May 7	Apr. 30 and May 14	δ Argûs : α Scorpii	2·0 : 1·3	82	29
		α Virginis : α Lyræ	1·2 : 0·1	88	30
May 8	May 1 and May 15	δ Argûs : α Trianguli Australis	2·0 : 1·9	49	29
		α Crucis : β Centauri	1·0 : 0·8	12	30
		ε Ursæ Majoris : λ Scorpii	1·8 : 1·8	110	30
		ε Ursæ Majoris : θ Scorpii	1·8 : 2·0	116	30
May 9	May 2 and May 16	β Canis Majoris : θ Scorpii	2·0 : 2·0	118	27
May 10	May 3 and May 17	ε Canis Majoris : λ Scorpii	1·6 : 1·8	111	28
May 11	May 4 and May 18	ε Canis Majoris : θ Scorpii	1·6 : 2·0	106	28
May 12	May 5 and May 19	ε Argûs : α Scorpii	1·7 : 1·3	82	29
		α Virginis : λ Scorpii	1·2 : 1·8	61	30
		α Virginis : θ Scorpii	1·2 : 2·0	63	30

Look in Star Distance List for the 1st Star of the pair in bold type.

EPHEMERIS, 1904.

Date.	Distance available between	Star Pair. Names.	Mags.	Approximate Distance.	Page.
				°	
May 13	May 6 and May 20	α Eridani : α Virginis	0·5 : 1·2	112	24
		α Virginis : α Cygni	1·2 : 1·3	111	30
		η Ursæ Majoris : λ Scorpii	1·9 : 1·8	100	31
		η Ursæ Majoris : θ Scorpii	1·9 : 2·0	105	31
		η Ursæ Majoris : α Cygni	1·9 : 1·3	64	31
May 15	May 8 and May 22	γ Crucis : α Scorpii	1·6 : 1·3	52	30
		α Ursæ Minoris : α Scorpii	2·1 : 1·3	117	24
May 16	May 9 and May 23	γ Argûs : λ Scorpii	1·9 : 1·8	89	29
		γ Argûs : θ Scorpii	1·9 : 2·0	84	29
May 17	May 10 and May 24	β Crucis : α Scorpii	1·5 : 1·3	50	30
		ϵ Ursæ Majoris : ϵ Sagittarii	1·8 : 1·9	114	30
May 18	May 11 and May 25	α Crucis : α Scorpii	1·0 : 1·3	53	30
		γ Crucis : α Trianguli Australis	1·6 : 1·9	30	30
		α Virginis : ϵ Sagittarii	1·2 : 1·9	71	30
May 19	May 12 and May 26	ϵ Argûs : α Trianguli Australis	1·7 : 1·9	46	29
		β Argûs : α Scorpii	1·7 : 1·3	72	29
May 20	May 13 and May 27	β Crucis : α Trianguli Australis	1·5 : 1·9	26	30
		η Ursæ Majoris : ϵ Sagittarii	1·9 : 1·9	104	31
May 21	May 14 and May 28	α Crucis : α Trianguli Australis	1·0 : 1·9	26	30
		α Virginis : α Pavonis	1·2 : 2·0	89	30
May 22	May 15 and May 29	δ Canis Majoris : ϵ Sagittarii	2·0 : 1·9	118	28
		δ Argûs : λ Scorpii	2·0 : 1·8	79	29
		δ Argûs : θ Scorpii	2·0 : 2·0	74	29
		β Centauri : α Scorpii	0·8 : 1·3	42	31
May 24	May 17 and May 31	β Argûs : α Trianguli Australis	1·7 : 1·9	34	29
		γ Crucis : λ Scorpii	1·6 : 1·8	52	30
		γ Crucis : θ Scorpii	1·6 : 2·0	48	30
May 25	May 18 and June 1	ϵ Argûs : θ Scorpii	1·7 : 2·0	72	29
		β Centauri : α Trianguli Australis	0·8 : 1·9	19	31

Look in Star Distance List for the 1st Star of the pair in bold type.

EPHEMERIS, 1904.

Date.	Distance available between	Star Pair. Names.	Mags.	Approximate Distance.	Page.
				°	
May 26	May 19 and June 2	ε Argûs : λ Scorpii	1·7 : 1·8	77	29
		β Crucis : λ Scorpii	1·5 : 1·8	50	30
		β Crucis : θ Scorpii	1·5 : 2·0	46	30
		β Centauri : λ Scorpii	0·8 : 1·8	40	31
		β Centauri : θ Scorpii	0·8 : 2·0	36	31
May 27	May 20 and June 3	ε Canis Majoris : ε Sagittarii	1·6 : 1·9	116	28
		γ Argûs : ε Sagittarii	1·9 : 1·9	95	29
		α Crucis : λ Scorpii	1·0 : 1·8	52	30
		α Crucis : θ Scorpii	1·0 : 2·0	47	30
		α Virginis : α Aquilæ	1·2 : 0·9	98	30
May 28	May 21 and June 4	α **Ursæ Minoris** : α Persei	2·1 : 1·9	39	24
May 30	May 23 and June 6	β Argûs : λ Scorpii	1·7 : 1·8	66	29
		β Argûs : θ Scorpii	1·7 : 2·0	61	29
		γ Crucis : ε Sagittarii	1·6 : 1·9	61	30
		α Virginis : α Gruis	1·2 : 1·9	107	30
June 1	May 25 and June 8	δ Argûs : ε Sagittarii	2·0 : 1·9	86	29
		β Centauri : α Lyræ	0·8 : 0·1	114	31
June 2	May 26 and June 9	β Crucis : ε Sagittarii	1·5 : 1·9	58	30
		α Scorpii : α Trianguli Australis	1·3 : 1·9	43	31
June 4	May 28 and June 11	α Crucis : ε Sagittarii	1·0 : 1·9	59	30
June 5	May 29 and June 12	α Scorpii : λ Scorpii	1·3 : 1·8	17	31
June 7	May 31 and June 14	ε Argûs : ε Sagittarii	1·7 : 1·9	83	29
		β Centauri : ε Sagittarii	0·8 : 1·9	48	31
		α Scorpii : θ Scorpii	1·3 : 2·0	22	31
June 8	June 1 and June 15	γ Crucis : α Pavonis	1·6 : 2·0	56	30
June 9	June 2 and June 16	ε Ursæ Majoris : α Aquilæ	1·8 : 0·9	90	30
		η Ursæ Majoris : α Aquilæ	1·9 : 0·9	84	31

Look in Star Distance List for the 1st Star of the pair in bold type.

EPHEMERIS, 1904.

Date.	Distance available between	Star Pair. Names.	Mags.	Approximate Distance.	Page.
				°	
June 10	June 3 and June 17	β Argûs : ε Sagittarii	1·7 : 1·9	71	29
		α Scorpii : α Lyræ	1·3 : 0·1	72	31
June 11	June 4 and June 18	β Crucis : α Pavonis	1·5 : 2·0	53	30
		α Scorpii : ε Sagittarii	1·3 : 1·9	26	31
June 12	June 5 and June 19	δ Argûs : α Pavonis	2·0 : 2·0	68	29
June 13	June 6 and June 20	α Crucis : α Pavonis	1·0 : 2·0	52	30
		α Trianguli Australis : λ Scorpii	1·9 : 1·8	33	31
June 14	June 7 and June 21	γ Argûs : α Pavonis	1·9 : 2·0	76	29
		α Trianguli Australis : θ Scorpii	1·9 : 2·0	27	31
		λ Scorpii : θ Scorpii	1·8 : 2·0	6	31
June 15	June 8 and June 22	α Ursæ Majoris : α Aquilæ	2·0 : 0·9	100	30
		β Centauri : α Pavonis	0·8 : 2·0	45	31
June 16	June 9 and June 23	γ Crucis : α Aquilæ	1·6 : 0·9	108	30
June 18	June 11 and June 25	β Crucis : α Aquilæ	1·5 : 0·9	106	30
		α Scorpii : α Pavonis	1·3 : 2·0	51	31
		α Trianguli Australis : ε Sagittarii	1·9 : 1·9	37	31
June 19	June 12 and June 26	α Trianguli Australis : α Lyræ	1·9 : 0·1	110	31
		λ Scorpii : ε Sagittarii	1·8 : 1·9	11	31
		θ Scorpii : ε Sagittarii	2·0 : 1·9	13	31
June 20	June 13 and June 27	α Crucis : α Aquilæ	1·0 : 0·9	107	30
June 21	June 14 and June 28	α Ursæ Majoris : α Cygni	2·0 : 1·3	69	30
		β Centauri : α Aquilæ	0·8 : 0·9	96	31
		λ Scorpii : α Lyræ	1·8 : 0·1	77	31
		θ Scorpii : α Lyræ	2·0 : 0·1	83	31
June 22	June 15 and June 29	β Argûs : α Pavonis	1·7 : 2·0	53	29
		γ Crucis : α Gruis	1·6 : 1·9	72	30

Look in Star Distance List for the 1st Star of the pair in bold type.

EPHEMERIS, 1904.

Date.	Distance available between	Star Pair. Names.	Mags.	Approximate Distance.	Page.
June 23	June 16 and June 30	α Eridani : β Centauri	0·5 : 0·8	62°	40
		ε Argûs : α Pavonis	1·7 : 2·0	64	29
June 24	June 17 and July 1	α Scorpii : α Aquilæ	1·3 : 0·9	60	31
June 25	June 18 and July 2	β Crucis : α Gruis	1·5 : 1·9	68	30
		α Scorpii : α Cygni	1·3 : 1·3	92	31
June 26	June 19 and July 3	α Eridani : α Scorpii	0·5 : 1·3	89	24
June 27	June 20 and July 4	θ Scorpii : α Pavonis	2·0 : 2·0	30	31
June 28	June 21 and July 5	α Crucis : α Gruis	1·0 : 1·9	67	30
		β Centauri : α Gruis	0·8 : 1·9	63	31
		α Trianguli Australis : α Pavonis	1·9 : 2·0	26	31
		λ Scorpii : α Pavonis	1·8 : 2·0	34	31
		ε Sagittarii : α Lyræ	1·9 : 0·1	73	31
June 29	June 22 and July 6	β Argûs : α Aquilæ	1·7 : 0·9	118	29
		α Scorpii : α Gruis	1·3 : 1·9	68	31
July 2	June 25 and July 9	λ Scorpii : α Aquilæ	1·8 : 0·9	56	31
		θ Scorpii : α Aquilæ	2·0 : 0·9	60	31
		ε Sagittarii : α Pavonis	1·9 : 2·0	30	31
July 3	June 26 and July 10	α Trianguli Australis : α Aquilæ	1·9 : 0·9	84	31
July 7	June 30 and July 14	λ Scorpii : α Cygni	1·8 : 1·3	93	31
		λ Scorpii : α Gruis	1·8 : 1·9	50	31
		ε Sagittarii : α Aquilæ	1·9 : 0·9	48	31
July 8	July 1 and July 15	θ Scorpii : α Cygni	2·0 : 1·3	97	31
July 9	July 2 and July 16	θ Scorpii : α Gruis	2·0 : 1·9	47	31
		α Lyræ : α Pavonis	0·1 : 2·0	98	31

Look in Star Distance List for the 1st Star of the pair in bold type.

EPHEMERIS, 1904.

Date.	Distance available between	Star Pair. Names.	Mags.	Approximate Distance.	Page.
July 10	July 3 and July 17	γ Crucis : α Piscis Australis.....	1·6 : 1·3	91°	30
		α Scorpii : α Piscis Australis	1·3 : 1·3	83	31
July 11	July 4 and July 18	α Eridani : θ Scorpii.....	0·5 : 2·0	68	24
July 12	July 5 and July 19	α Trianguli Australis : α Gruis....	1·9 : 1·9	44	31
July 13	July 6 and July 20	β Argûs : α Gruis.....	1·7 : 1·9	63	29
		β Crucis : α Piscis Australis.....	1·5 : 1·3	88	30
		β Centauri : α Piscis Australis....	0·8 : 1·3	82	31
		ϵ Sagittarii : α Gruis	1·9 : 1·9	43	31
July 14	July 7 and July 21	α Eridani : α Trianguli Australis..	0·5 : 1·9	49	24
		ϵ Sagittarii : α Cygni	1·9 : 1·3	86	31
July 15	July 8 and July 22	α Crucis : α Piscis Australis.....	1·0 : 1·3	86	30
July 16	July 9 and July 23	α Lyræ : α Aquilæ	0·1 : 0·9	34	31
July 17	July 10 and July 24	α **Ursæ Minoris** : α Ursæ Majoris	2·1 : 2·0	29	24
		α Eridani : ϵ Sagittarii.....	0·5 : 1·9	70	24
		α Aquilæ : α Pavonis.....	0·9 : 2·0	66	32
July 18	July 11 and July 25	λ Scorpii : α Piscis Australis.....	1·8 : 1·3	66	31
July 19	July 12 and July 26	θ Scorpii : α Piscis Australis.....	2·0 : 1·3	63	31
July 23	July 16 and July 30	ϵ Sagittarii : α Piscis Australis....	1·9 : 1·3	57	31
July 24	July 17 and July 31	α Lyræ : α Gruis.....	0·1 : 1·9	98	31
		α Pavonis : α Gruis.....	2·0 : 1·9	18	32
July 25	July 18 and Aug. 1	α Trianguli Aust. : α Piscis Aust.	1·9 : 1·3	63	31
July 28	July 21 and Aug. 4	α Aquilæ : α Gruis.....	0·9 : 1·9	64	32

Look in Star Distance List for the 1st Star of the pair in bold type.

EPHEMERIS, 1904.

Date.	Distance available between	Star Pair. Names.	Mags.	Approximate Distance.	Page.
July 29	July 22 and Aug. 5	α **Ursæ Minoris** : ε Ursæ Majoris	2·1 : 1·8	35°	38
July 30	July 23 and Aug. 6	α Lyræ : α Cygni	0·1 : 1·3	24	31
		α Pavonis : α Cygni	2·0 : 1·3	102	32
Aug. 2	July 26 and Aug. 9	α Eridani : α Pavonis	0·5 : 2·0	40	24
Aug. 3	July 27 and Aug. 10	β Argûs . α Piscis Australis	1·7 : 1·3	79	29
		α Aquilæ : α Cygni	0·9 : 1·3	38	32
Aug. 4	July 28 and Aug. 11	α Pavonis : α Piscis Australis	2·0 : 1·3	38	32
Aug. 6	July 30 and Aug. 13	α Eridani : α Aquilæ	0·5 : 0·9	96	24
		α Lyræ : α Piscis Australis	0·1 : 1·3	91	31
Aug. 7	July 31 and Aug. 14	α Aquilæ : α Piscis Australis	0·9 : 1·3	59	32
Aug. 10	Aug. 3 and Aug. 17	α **Ursæ Minoris** : η Ursæ Majoris	2·1 : 1·9	41	39
Aug. 12	Aug. 5 and Aug. 19	α Cygni : α Gruis	1·3 : 1·9	94	32
Aug. 13	Aug. 6 and Aug. 20	δ Argûs : α Piscis Australis	2·0 : 1·3	91	29
Aug. 14	Aug. 7 and Aug. 21	α **Ursæ Minoris** : α Aquilæ	2·1 : 0·9	81	24
		ε Argûs : α Piscis Australis	1·7 : 1·3	85	29
		α Gruis : α Piscis Australis	1·9 : 1·3	20	32
Aug. 15	Aug. 8 and Aug. 22	α Eridani : α Gruis	0·5 : 1·9	33	24
Aug. 23	Aug. 16 and Aug. 30	α Cygni : α Piscis Australis	1·3 : 1·3	81	32
Aug. 27	Aug. 20 and Sept. 3	γ Argûs : ε Argûs	1·9 : 1·7	12	28
		γ Argûs : δ Argûs	1·9 : 2·0	9	28

Look in Star Distance List for the 1st Star of the pair in bold type.

EPHEMERIS, 1904.

Date.	Distance available between	Star Pair. Names.	Mags.	Approximate Distance.	Page.
Aug. 28	Aug. 21 and Sept. 4	γ Argûs : α Piscis Australis	1·9 : 1·3	94	29
Aug. 29	Aug. 22 and Sept. 5	α **Ursæ Minoris** : α Lyræ	2·1 : 0·1	52	24
Sept. 5	Aug. 29 and Sept. 12	β Canis Majoris : α Trianguli Australis	2·0 : 1·9	91	27
Sept. 20	Sept. 13 and Sept. 27	α **Ursæ Minoris** : α Piscis Aust..	2·1 : 1·3	119	24
		ε Canis Majoris : α Gruis	1·6 : 1·9	93	28
Sept. 21	Sept. 14 and Sept. 28	β Canis Majoris : α Pavonis.....	2·0 : 2·0	101	27
		ε Ursæ Majoris : α Cygni	1·8 : 1·3	66	30
Sept. 22	Sept. 15 and Sept. 29	α Persei : α Aquilæ	1·9 : 0·9	98	24
		α Ursæ Majoris : α Lyræ..	2·0 : 0·1	66	30
Sept. 24	Sept. 17 and Oct. 1	δ Canis Majoris : α Gruis.....	2·0 : 1·9	96	28
Sept. 28	Sept. 21 and Oct. 5	β Orionis : α Pavonis.....	0·3 : 2·0	104	25
Sept. 30	Sept. 23 and Oct. 7	α Persei : α Gruis.....	1·9 : 1·9	118	24
Oct. 5	Sept. 28 and Oct. 12	α Aurigæ : α Aquilæ.....	0·2 : 0·9	115	25
Oct. 6	Sept. 29 and Oct. 13	α Persei : α Piscis Australis.....	1·9 : 1·3	99	24
		ε Canis Majoris : α Piscis Australis	1·6 : 1·3	98	28
Oct. 7	Sept. 30 and Oct. 14	β Orionis : α Gruis.....	0·3 : 1·9	95	25
Oct. 8	Oct. 1 and Oct. 15	β Canis Majoris : α Gruis.....	2·0 : 1·9	98	27
Oct. 10	Oct. 3 and Oct. 17	ε Orionis : α Pavonis	1·7 : 2·0	113	26
		ζ Orionis : α Pavonis.....	2·0 : 2·0	113	27

Look in Star Distance List for the 1st Star of the pair in bold type.

EPHEMERIS, 1904.

Date.	Distance available between	Star Pair. Names.	Mags.	Approximate Distance.	Page.
				°	
Oct. 11	Oct. 4 and Oct. 18	α Tauri : α Gruis	1·1 : 1·9	107	25
		β Orionis : α Piscis Australis	0·3 : 1·3	90	25
Oct. 14	Oct. 7 and Oct. 21	α **Ursæ Minoris** : α Cygni	2·1 : 1·3	45	24
		α Tauri : α Piscis Australis	1·1 : 1·3	94	25
		ζ Orionis : α Gruis	2·0 : 1·9	104	27
Oct. 15	Oct. 8 and Oct. 22	γ Orionis : α Pavonis	1·7 : 2·0	118	26
		ε Orionis : α Gruis	1·7 : 1·9	104	26
		β Canis Majoris : α Piscis Australis	2·0 : 1·3	98	27
Oct. 17	Oct. 10 and Oct. 24	α Aurigæ : α Piscis Australis	0·2 : 1·3	114	25
		γ Orionis : α Gruis	1·7 : 1·9	108	26
		ε Orionis : α Piscis Australis	1·7 : 1·3	98	26
Oct. 18	Oct. 11 and Oct. 25	ζ Orionis : α Piscis Australis	2·0 : 1·3	98	27
Oct. 19	Oct. 12 and Oct. 26	γ Orionis : α Piscis Australis	1·7 : 1·3	99	26
Oct. 21	Oct. 14 and Oct. 28	β Tauri : α Piscis Australis	1·8 : 1·3	109	26
Oct. 22	Oct. 15 and Oct. 29	α Persei : α Lyræ	1·9 : 0·1	82	24
		α Persei : α Cygni	1·9 : 1·3	63	24
		α Orionis : α Gruis	1·0–1·4 : 1·9	114	27
Oct. 23	Oct. 16 and Oct. 30	α Orionis : α Piscis Australis	1·0–1·4 : 1·3	106	27
Oct. 25	Oct. 18 and Nov. 1	α Eridani : α Persei	0·5 : 1·9	109	24
Oct. 30	Oct. 23 and Nov. 6	α Eridani : γ Argûs	0·5 : 1·9	55	24
		γ Geminorum : α Piscis Australis	1·9 : 1·3	119	27
Nov. 1	Oct. 25 and Nov. 8	α Crucis : β Crucis	1·0 : 1·5	4	30
Nov. 2	Oct. 26 and Nov. 9	α Eridani : α Tauri	0·5 : 1·1	82	24
		α Tauri : α Cygni	1·1 : 1·3	97	25

Look in Star Distance List for the 1st Star of the pair in bold type.

EPHEMERIS, 1904.

Date.	Distance available between	Star Pair. Names.	Mags.	Approximate Distance.	Page.
Nov. 5	Oct. 29 and Nov. 12	α Eridani : β Orionis	0·5 : 0·3	64°	24
		α Tauri : α Lyræ	1·1 : 0·1	118	25
Nov. 8	Nov. 1 and Nov. 15	α Aurigæ : α Cygni	0·2 : 1·3	78	25
Nov. 10	Nov. 3 and Nov. 17	γ Orionis : α Cygni	1·7 : 1·3	112	26
Nov. 11	Nov. 4 and Nov. 18	α Eridani : α Aurigæ	0·5 : 0·2	113	24
		α Eridani : γ Orionis	0·5 : 1·7	78	24
Nov. 12	Nov. 5 and Nov. 19	α Eridani : ε Orionis	0·5 : 1·7	73	24
		α Eridani : ζ Orionis	0·5 : 2·0	73	24
Nov. 14	Nov. 7 and Nov. 21	α Eridani : β Tauri	0·5 : 1·8	98	24
		β Tauri : α Cygni	1·8 : 1·3	94	26
Nov. 17	Nov. 10 and Nov. 24	α Orionis : α Cygni	1·0–1·4 : 1·3	115	27
Nov. 18	Nov. 11 and Nov. 25	α Eridani : β Canis Majoris	0·5 : 2·0	65	24
Nov. 19	Nov. 12 and Nov. 26	α Eridani : α Orionis	0·5 : 1·0–1·4	83	24
		α Eridani : ε Canis Majoris	0·5 : 1·6	61	24
		α Aurigæ : α Lyræ	0·2 : 0·1	93	25
Nov. 24	Nov. 17 and Dec. 1	α Eridani : δ Canis Majoris	0·5 : 2·0	64	24
		β Tauri : α Lyræ	1·8 : 0·1	111	26
Nov. 25	Nov. 18 and Dec. 2	α Persei : α Tauri	1·9 : 1·1	36	24
Nov. 28	Nov. 21 and Dec. 5	α Eridani : γ Geminorum	0·5 : 1·9	96	24
		α Persei : β Orionis	1·9 : 0·3	63	24
		γ Geminorum : α Cygni	1·9 : 1·3	112	27
Nov. 30	Nov. 23 and Dec. 7	α **Ursæ Minoris** : α Persei	2·1 : 1·9	39	24
Dec. 1	Nov. 24 and Dec. 8	α Persei : α Aurigæ	1·9 : 0·2	19	24

Look in Star Distance List for the 1st Star of the pair in bold type.

EPHEMERIS, 1904.

Date.	Distance available between	Star Pair. Names.	Mags.	Approximate Distance.	Page.
				°	
Dec. 2	Nov. 25 and Dec. 9	α Persei : γ Orionis	1·9 : 1·7	50	24
		α Persei : β Tauri	1·9 : 1·8	31	24
		α Persei : ε Orionis	1·9 : 1·7	58	24
Dec. 3	Nov. 26 and Dec. 10	α Persei : ζ Orionis	1·9 : 2·0	60	24
		α Tauri : β Orionis	1·1 : 0·3	26	25
Dec. 5	Nov. 28 and Dec. 12	α **Ursæ Minoris** : α Tauri	2·1 : 1·1	73	24
		α Tauri : α Aurigæ	1·1 : 0·2	31	25
		α Tauri : γ Orionis	1·1 : 1·7	16	25
Dec. 6	Nov. 29 and Dec. 13	α Persei : α Orionis	1·9 : 1·0–1·4	53	24
		α Tauri : β Tauri	1·1 : 1·8	17	25
Dec. 7	Nov. 30 and Dec. 14	α Tauri : ε Orionis	1·1 : 1·7	23	25
		α Tauri : ζ Orionis	1·1 : 2·0	24	25
Dec. 8	Dec. 1 and Dec. 15	α Persei : β Canis Majoris	1·9 : 2·0	78	24
		α Aurigæ : β Orionis	0·2 : 0·3	54	33
		β Orionis : γ Orionis	0·3 : 1·7	15	25
Dec. 9	Dec. 2 and Dec. 16	α Eridani : α Geminorum	0·5 : 2·0	116	24
		β Orionis : β Tauri	0·3 : 1·8	37	25
		β Orionis : ε Orionis	0·3 : 1·7	9	25
		β Orionis : ζ Orionis	0·3 : 2·0	9	25
Dec. 10	Dec. 3 and Dec. 17	α Tauri : α Orionis	1·1 : 1·0–1·4	21	25
Dec. 11	Dec. 4 and Dec. 18	α **Ursæ Minoris** : β Orionis	2·1 : 0·3	98	24
		α Persei : γ Geminorum	1·9 : 1·9	51	24
		α Tauri : β Canis Majoris	1·1 : 2·0	43	25
		α Aurigæ : γ Orionis	0·2 : 1·7	40	25
		γ Orionis : β Tauri	1·7 : 1·8	22	25
		α Geminorum : α Cygni	2·0 : 1·3	101	28
Dec. 12	Dec. 5 and Dec. 19	α Persei : ε Canis Majoris	1·9 : 1·6	92	24
		α Aurigæ : β Tauri	0·2 : 1·8	17	25
		α Aurigæ : ε Orionis	0·2 : 1·7	47	25
		β Orionis : α Orionis	0·3 : 1·0–1·4	19	25
		γ Orionis : ε Orionis	1·7 : 1·7	8	25
		γ Orionis : ζ Orionis	1·7 : 2·0	9	25

Look in Star Distance List for the 1st Star of the pair in bold type.

EPHEMERIS, 1904.

Date.	Distance available between	Star Pair. Names.	Mags.	Approximate Distance.	Page.
Dec. 13	Dec. 6 and Dec. 20	α **Ursæ Minoris** : γ Orionis	2·1 : 1·7	83	24
		α Persei : δ Canis Majoris	1·9 : 2·0	91	24
		α Tauri : β Argûs	1·1 : 1·7	99	25
		α Aurigæ : ζ Orionis	0·2 : 2·0	48	25
		β Tauri : ε Orionis	1·8 : 1·7	30	26
		β Tauri : ζ Orionis	1·8 : 2·0	31	26
Dec. 14	Dec. 7 and Dec. 21	α **Ursæ Minoris** : α Aurigæ	2·1 : 0·2	43	24
		α **Ursæ Minoris** : β Tauri	2·1 : 1·8	61	24
		α Tauri : γ Geminorum	1·1 : 1·9	29	25
		β Geminorum : α Cygni	1·2 : 1·3	106	28
		γ Argûs : α Pavonis	1·9 : 2·0	76	29
Dec. 15	Dec. 8 and Dec. 22	α **Ursæ Minoris** : ε Orionis	2·1 : 1·7	91	24
		α **Ursæ Minoris** : ζ Orionis	2·1 : 2·0	91	24
		α Eridani : γ Crucis	0·5 : 1·6	65	24
		α Tauri : ε Canis Majoris	1·1 : 1·6	57	25
		α Aurigæ : α Orionis	0·2 : 1·0–1·4	39	25
		γ Orionis : α Orionis	1·7 : 1·0–1·4	8	25
		β Tauri : α Orionis	1·8 : 1·0–1·4	22	26
Dec. 16	Dec. 9 and Dec. 23	β Orionis : β Canis Majoris	0·3 : 2·0	19	25
		ε Orionis : α Orionis	1·7 : 1·0–1·4	10	26
		ζ Orionis : α Orionis	2·0 : 1·0–1·4	10	26
Dec. 17	Dec. 10 and Dec. 24	α **Ursæ Minoris** : α Orionis	2·1 : 1·0–1·4	82	24
		α Persei : γ Argûs	1·9 : 1·9	115	24
		α Tauri : δ Canis Majoris	1·1 : 2·0	57	25
		α Tauri : ε Argûs	1·1 : 1·7	89	25
		γ Orionis : β Canis Majoris	1·7 : 2·0	28	25
Dec. 18	Dec. 11 and Dec. 25	α Eridani : β Crucis	0·5 : 1·5	63	24
		α Persei : α Geminorum	1·9 : 2·0	49	24
		α Aurigæ : β Canis Majoris	0·2 : 2·0	66	25
		β Orionis : γ Geminorum	0·3 : 1·9	32	25
Dec. 19	Dec. 12 and Dec. 26	β Tauri : β Canis Majoris	1·8 : 2·0	49	26
		ε Orionis : β Canis Majoris	1·7 : 2·0	20	26
Dec. 20	Dec. 13 and Dec. 27	α Persei : β Geminorum	1·9 : 1·2	53	24
		α Tauri : α Geminorum	1·1 : 2·0	43	25
		β Tauri : γ Geminorum	1·8 : 1·9	20	26
		ζ Orionis : β Canis Majoris	2·0 : 2·0	19	26

Look in Star Distance List for the 1st Star of the pair in bold type.

EPHEMERIS, 1904.

Date.	Distance available between	Star Pair. Names.	Mags.	Approximate Distance.	Page.
				°	
Dec. 21	Dec. 14 and Dec. 28	α Tauri : β Geminorum	1·1 : 1·2	45	25
		α Tauri : γ Argûs	1·1 : 1·9	80	25
		α Aurigæ : γ Geminorum	0·2 : 1·9	34	25
		β Orionis : ε Canis Majoris	0·3 : 1·6	32	25
		γ Orionis : γ Geminorum	1·7 : 1·9	20	26
		ε Orionis : γ Geminorum	1·7 : 1·9	23	26
Dec. 22	Dec. 15 and Dec. 29	α Persei : α Ursæ Majoris	1·9 : 2·0	57	24
		α Tauri : δ Argûs	1·1 : 2·0	88	25
		β Orionis : δ Canis Majoris	0·3 : 2·0	33	25
		ζ Orionis : γ Geminorum	2·0 : 1·9	23	26
Dec. 23	Dec. 16 and Dec. 30	α Eridani : α Crucis	0·5 : 1·0	59	24
		α Aurigæ : ε Canis Majoris	0·2 : 1·6	78	25
		γ Orionis : ε Canis Majoris	1·7 : 1·6	42	26
		β Tauri : ε Canis Majoris	1·8 : 1·6	62	26
		α Orionis : β Canis Majoris	1·0–1·4 : 2·0	26	27
Dec. 24	Dec. 17 and Dec. 31	α Aurigæ : δ Canis Majoris	0·2 : 2·0	77	25
		β Orionis : α Geminorum	0·3 : 2·0	52	25
		γ Orionis : δ Canis Majoris	1·7 : 2·0	41	26
		ε Orionis : ε Canis Majoris	1·7 : 1·6	34	26
		α Orionis : γ Geminorum	1·0–1·4 : 1·9	14	27
Dec. 25	Dec. 18 and Jan. 1	α **Ursæ Minoris** : β Canis Majoris	2·1 : 2·0	108	24
		α **Ursæ Minoris** : γ Geminorum	2·1 : 1·9	73	24
		α Tauri : α Ursæ Majoris	1·1 : 2·0	79	25
		β Orionis : β Argûs	0·3 : 1·7	72	25
		γ Orionis : α Geminorum	1·7 : 2·0	40	26
		β Tauri : δ Canis Majoris	1·8 : 2·0	60	26
		ε Orionis : δ Canis Majoris	1·7 : 2·0	34	26
		ζ Orionis : ε Canis Majoris	2·0 : 1·6	33	26
Dec. 26	Dec. 19 and Jan. 2	α Aurigæ : α Geminorum	0·2 : 2·0	30	25
		β Orionis : β Geminorum	0·3 : 1·2	51	25
		β Orionis : ε Argûs	0·3 : 1·7	62	25
		β Tauri : α Geminorum	1·8 : 2·0	28	26
		ε Orionis : α Geminorum	1·7 : 2·0	43	26
		ζ Orionis : δ Canis Majoris	2·0 : 2·0	32	26

Look in Star Distance List for the 1st Star of the pair in bold type.

EPHEMERIS, 1904.

Date.	Distance available between	Star Pair. Names.	Mags.	Approximate Distance.	Page.
				°	
Dec. 27	Dec. 20 and Jan. 3	α Persei : ε Ursæ Majoris	1·9 : 1·8	70	24
		γ Orionis : β Geminorum	1·7 : 1·2	40	26
		γ Orionis : ε Argûs	1·7 : 1·7	75	26
		β Tauri : β Argûs	1·8 : 1·7	106	26
		ζ Orionis : α Geminorum	2·0 : 2·0	43	26
		α Orionis : ε Canis Majoris	1·0–1·4 : 1·6	39	27
		β Canis Majoris : γ Geminorum	2·0 : 1·9	35	27
Dec. 28	Dec. 21 and Jan. 4	α Aurigæ : β Geminorum	0·2 : 1·2	34	25
		β Orionis : γ Argûs	0·3 : 1·9	54	25
		γ Orionis : β Argûs	1·7 : 1·7	85	26
		β Tauri : β Geminorum	1·8 : 1·2	31	26
		β Tauri : ε Argûs	1·8 : 1·7	95	26
		ε Orionis : β Geminorum	1·7 : 1·2	43	26
		α Orionis : δ Canis Majoris	1·0–1·4 : 2·0	38	27
Dec. 29	Dec. 22 and Jan. 5	α Tauri : α Crucis	1·1 : 1·0	117	25
		α Tauri : ε Ursæ Majoris	1·1 : 1·8	94	25
		α Aurigæ : ε Argûs	0·2 : 1·7	112	25
		β Tauri : γ Argûs	1·8 : 1·9	84	26
		ζ Orionis : β Geminorum	2·0 : 1·2	42	26
		α Orionis : α Geminorum	1·0–1·4 : 2·0	34	27
Dec. 30	Dec. 23 and Jan. 6	α Aurigæ : γ Argûs	0·2 : 1·9	101	25
		γ Orionis : γ Argûs	1·7 : 1·9	65	26
		ε Orionis : ε Argûs	1·7 : 1·7	67	26
Dec. 31	Dec. 24 and Jan. 7	α **Ursæ Minoris** : ε Canis Majoris	2·1 : 1·6	119	24
		α Persei : η Ursæ Majoris	1·9 : 1·9	79	24
		β Orionis : δ Argûs	0·3 : 2·0	62	25
		β Orionis : α Ursæ Majoris	0·3 : 2 0	96	25
		ε Orionis : γ Argûs	1·7 : 1·9	57	26
		ε Orionis : β Argûs	1·7 : 1·7	77	26
		ζ Orionis : ε Argûs	2·0 : 1·7	65	26
		α Orionis : β Geminorum	1·0–1·4 : 1·2	33	27

Look in Star Distance List for the 1st Star of the pair in bold type.

DISTANCES OF THE STAR PAIRS, Etc.

Star Pair.	Distance.	R.A. and Dec. of Fictitious Star.	
α Ursæ Minoris.			
(*Polaris*) 1h 24m. N. 88° 48′. and :—	° ′ ″	h m	°
α Persei (*Mirfak*)	39 25 21	9 20	1 N
α Tauri (*Aldebaran*)	72 51 23	10 31	1 N
α Aurigæ (*Capella*)	43 26 25	11 14	1 N
β Orionis (*Rigel*)	97 38 40	11 9	1 N
γ Orionis (*Bellatrix*)	83 6 58	11 21	1 N
β Tauri (*Nath*)	60 51 27	11 23	1 N
ε Orionis (*Alnilam*)	90 41 34	11 31	1 N
ζ Orionis	91 26 39	11 36	1 N
α Orionis (*Betelguese*)	82 7 48	11 51	1 N
β Canis Majoris (*Mirzam*)	107 33 47	12 17	1 N
γ Geminorum (*Alhena*)	73 15 2	12 34	1 N
ε Canis Majoris (*Adara*)	118 40 48	12 52	1 N
δ Canis Majoris	116 7 50	13 2	1 N
α Geminorum (*Castor*)	57 55 50	13 32	1 N
β Geminorum (*Pollux*)	61 49 41	13 42	1 N
α Leonis (*Regulus*)	78 20 8	16 4	1 N
α Ursæ Majoris (*Dubhe*)	28 42 23	17 3	1 N
ε Ursæ Majoris (*Alioth*)	See	page	38.
α Virginis (*Spica*)	See	page	38.
η Ursæ Majoris (*Benetnasch*)	See	page	39.
α Scorpii (*Antares*)	117 4 16	22 17	1 S
α Lyræ (*Vega*)	51 34 46	0 30	1 S
α Aquilæ (*Altair*)	81 16 22	1 45	1 S
α Cygni (*Deneb*)	44 41 33	2 34	1 S
α Piscis Australis (*Fomalhaut*)	119 10 43	4 54	1 S
α Eridani.			
(*Achernar*) 1h 34m. S. 57° 43′. and :—			
α Persei (*Mirfak*)	109 20 5	8 32	9 S
α Tauri (*Aldebaran*)	82 29 25	10 2	21 S
α Aurigæ (*Capella*)	112 49 57	9 47	19 S
β Orionis (*Rigel*)	64 19 43	11 26	28 S
γ Orionis (*Bellatrix*)	78 24 8	11 7	27 S
β Tauri (*Nath*)	98 20 9	10 26	23 S
ε Orionis (*Alnilam*)	73 4 15	11 32	28 S
ζ Orionis	72 59 0	11 37	28 S
α Orionis (*Betelguese*)	82 53 30	11 32	28 S
β Canis Majoris (*Mirzam*)	64 52 4	13 2	32 S
γ Geminorum (*Alhena*)	95 55 2	11 50	30 S
ε Canis Majoris (*Adara*)	60 48 52	14 15	31 S
δ Canis Majoris	64 10 31	14 9	31 S
α Geminorum (*Castor*)	115 59 0	12 2	29 S
β Geminorum (*Pollux*)	114 16 44	12 26	31 S

Star Pair.	Distance.	R.A. and Dec. of Fictitious Star.	
α Eridani—*continued.*			
	° ′ ″	h m	°
γ Argûs	55 25 8	16 9	26 S
ε Argûs	47 50 8	5 1	21 N
δ Argûs	53 23 58	17 0	21 S
β Argûs	44 32 7	5 59	14 N
α Leonis (*Regulus*)	119 51 50	15 35	29 S
α Crucis	58 53 11	7 1	5 N
γ Crucis	64 52 56	19 1	7 S
β Crucis	62 39 34	7 6	4 N
α Virginis (*Spica*)	111 33 18	19 18	3 S
β Centauri	See	page	40.
α Scorpii (*Antares*)	88 53 2	21 47	18 N
α Trianguli Australis	49 5 8	8 42	11 S
λ Scorpii	73 27 3	22 11	22 N
θ Scorpii	67 58 32	22 5	21 N
ε Sagittarii	70 29 11	22 55	26 N
α Aquilæ (*Altair*)	95 41 15	2 4	31 N
α Pavonis	40 6 52	22 57	27 N
α Cygni (*Deneb*)	119 32 10	4 22	25 N
α Gruis	32 50 58	1 7	32 N
α Piscis Australis (*Fomalhaut*)	39 6 55	3 38	27 N
α Persei.			
(*Mirfak*) 3h 18m. N. 49° 31′. and :—			
α Tauri (*Aldebaran*)	36 20 50	10 52	18 N
α Aurigæ (*Capella*)	19 5 26	15 15	40 N
β Orionis (*Rigel*)	62 49 54	10 57	20 N
γ Orionis (*Bellatrix*)	50 20 17	11 32	25 N
β Tauri (*Nath*)	31 22 45	12 45	33 N
ε Orionis (*Alnilam*)	58 21 21	11 28	24 N
ζ Orionis	59 30 7	11 32	25 N
α Orionis (*Betelguese*)	52 49 28	12 7	29 N
β Canis Majoris (*Mirzam*)	78 24 18	11 42	26 N
γ Geminorum (*Alhena*)	51 10 54	13 22	36 N
ε Canis Majoris (*Adara*)	92 1 55	11 44	27 N
δ Canis Majoris	90 58 46	12 0	28 N
α Geminorum (*Castor*)	49 0 24	15 32	39 N
β Geminorum (*Pollux*)	53 19 24	15 34	39 N
γ Argûs	114 58 10	11 52	27 N
α Leonis (*Regulus*)	87 49 26	16 40	37 N
α Ursæ Majoris (*Dubhe*)	56 57 44	7 42	19 S
ε Ursæ Majoris (*Alioth*)	69 39 53	8 10	13 S
η Ursæ Majoris (*Benetnasch*)	78 40 34	8 26	9 S
α Lyræ (*Vega*)	81 45 4	23 14	23 S
α Aquilæ (*Altair*)	97 46 18	1 22	37 S
α Cygni (*Deneb*)	62 41 19	0 9	31 S
α Gruis	118 21 28	6 33	28 S
α Piscis Australis (*Fomalhaut*)	98 58 20	6 15	31 S

Look for the Star with the *smaller* R.A. in bold type.

DISTANCES OF THE STAR PAIRS, Etc.

α Tauri.

(*Aldebaran*) $4^h\ 30^m$. N. 16° 19′.
and :—

Star Pair.	Distance.	R.A. and Dec. of Fictitious Star.	
	° ′ ″	h m	°
α Aurigæ (*Capella*)	30 41 44	10 12	13 S
β Orionis (*Rigel*)	26 29 54	10 56	22 N
γ Orionis (*Bellatrix*)	15 45 29	11 54	51 N
β Tauri (*Nath*)	16 45 22	9 34	37 S
ε Orionis (*Alnilam*)	23 8 2	11 26	41 N
ζ Orionis	24 25 50	11 27	42 N
α Orionis (*Betelguese*)	21 23 31	12 52	64 N
β Canis Majoris (*Mirzam*)	43 20 54	11 22	37 N
γ Geminorum (*Alhena*)	29 10 23	5 50	73 S
ε Canis Majoris (*Adara*)	57 4 4	11 17	36 N
δ Canis Majoris	56 40 54	11 27	40 N
α Geminorum (*Castor*)	43 11 48	8 48	56 S
β Geminorum (*Pollux*)	45 1 45	8 25	62 S
γ Argûs	79 43 43	11 14	33 N
ε Argûs	88 42 44	11 2	24 N
δ Argûs	88 29 19	11 8	30 N
β Argûs	98 35 22	10 52	18 N
α Leonis (*Regulus*)	80 8 18	18 47	71 N
α Ursæ Majoris (*Dubhe*)	78 43 52	9 56	26 S
α Crucis	117 3 44	11 5	26 N
γ Crucis	119 18 55	11 9	32 N
ε Ursæ Majoris (*Alioth*)	93 56 4	9 58	26 S
η Ursæ Majoris (*Benetnasch*)	104 22 36	9 59	25 S
α Lyræ (*Vega*)	117 52 54	11 2	25 N
α Cygni (*Deneb*)	96 57 34	11 22	37 N
α Gruis	106 39 27	9 27	42 S
α Piscis Australis (*Fomalhaut*)	93 32 15	8 50	55 S

α Aurigæ.

(*Capella*) $5^h\ 10^m$. N. 45° 54′.
and :—

Star Pair.	Distance.	R.A. and Dec. of Fictitious Star.	
	° ′ ″	h m	°
β Orionis (*Rigel*)	See page 33.		
γ Orionis (*Bellatrix*)	39 42 5	11 24	3 N
β Tauri (*Nath*)	17 29 59	11 32	6 N
ε Orionis (*Alnilam*)	47 24 28	11 32	6 N
ζ Orionis	48 14 48	11 37	7 N
α Orionis (*Betelguese*)	39 29 2	11 58	12 N
β Canis Majoris (*Mirzam*)	65 41 20	12 2	13 N
γ Geminorum (*Alhena*)	34 5 6	13 4	25 N
ε Canis Majoris (*Adara*)	78 27 47	12 20	16 N
δ Canis Majoris	76 42 38	12 28	18 N
α Geminorum (*Castor*)	29 59 3	15 50	42 N
β Geminorum (*Pollux*)	34 15 15	15 35	42 N
γ Argûs	100 43 14	12 37	20 N
ε Argûs	112 9 40	12 24	17 N
δ Argûs	109 53 18	12 39	21 N

α Aurigæ—*continued.*

Star Pair.	Distance.	R.A. and Dec. of Fictitious Star.	
	° ′ ″	h m	°
α Leonis (*Regulus*)	69 35 50	16 56	44 N
α Ursæ Majoris (*Dubhe*)	49 17 5	9 17	25 S
ε Ursæ Majoris (*Alioth*)	64 9 8	9 26	23 S
η Ursæ Majoris (*Benetnasch*)	74 25 23	9 37	21 S
α Lyræ (*Vega*)	93 19 39	23 59	11 S
α Aquilæ (*Altair*)	115 13 35	1 27	28 S
α Cygni (*Deneb*)	78 10 33	0 56	23 S
α Piscis Australis (*Fomalhaut*)	113 56 16	6 55	41 S

β Orionis.

(*Rigel*) $5^h\ 10^m$. S. 8° 19′.
and :—

Star Pair.	Distance.	R.A. and Dec. of Fictitious Star.	
	° ′ ″	h m	°
γ Orionis (*Bellatrix*)	14 47 22	11 12	10 S
β Tauri (*Nath*)	36 55 22	11 9	3 S
ε Orionis (*Alnilam*)	8 50 20	11 32	36 S
ζ Orionis	9 2 33	11 40	44 S
α Orionis (*Betelguese*)	18 36 20	11 30	32 S
β Canis Majoris (*Mirzam*)	19 13 47	10 17	58 N
γ Geminorum (*Alhena*)	32 4 19	11 32	38 S
ε Canis Majoris (*Adara*)	32 5 19	10 38	46 N
δ Canis Majoris	32 33 29	10 26	52 N
α Geminorum (*Castor*)	52 12 19	11 36	36 S
β Geminorum (*Pollux*)	51 22 54	11 40	42 S
γ Argûs	53 52 58	10 49	36 N
ε Argûs	62 15 37	10 56	25 N
δ Argûs	62 20 19	10 48	32 N
β Argûs	72 7 14	10 56	19 N
α Leonis (*Regulus*)	75 45 36	13 2	72 S
α Ursæ Majoris (*Dubhe*)	95 56 55	11 26	27 S
α Crucis	90 38 49	10 56	26 N
γ Crucis	93 14 40	10 55	31 N
β Crucis	94 16 4	10 52	28 N
ε Ursæ Majoris (*Alioth*)	110 33 39	11 29	32 S
α Virginis (*Spica*)	119 46 5	9 26	71 N
β Centauri	101 51 21	10 56	22 N
α Trianguli Australis	102 38 20	11 8	3 N
α Pavonis	104 12 59	11 22	23 S
α Gruis	95 4 45	11 35	40 S
α Piscis Australis (*Fomalhaut*)	89 35 55	12 2	58 S

γ Orionis.

(*Bellatrix*) $5^h\ 20^m$. N. 6° 16′.
and :—

Star Pair.	Distance.	R.A. and Dec. of Fictitious Star.	
	° ′ ″	h m	°
β Tauri (*Nath*)	22 15 50	11 20	0
ε Orionis (*Alnilam*)	8 2 32	11 26	18 N
ζ Orionis	9 9 51	11 30	25 N
α Orionis (*Betelguese*)	7 31 47	8 42	81 S
β Canis Majoris (*Mirzam*)	28 9 11	11 35	30 N

Look for the Star with the *smaller* R.A. in bold type.

DISTANCES OF THE STAR PAIRS, Etc.

Star Pair.	Distance.	R.A. and Dec. of Fictitious Star.	
γ Orionis—*continued.*	° ′ ″	h m	°
γ Geminorum (*Alhena*)	20 24 20	10 43	58 S
ε Canis Majoris (*Adara*)	41 52 42	11 35	32 N
δ Canis Majoris	41 12 49	11 41	36 N
α Geminorum (*Castor*)	39 32 43	10 56	44 S
β Geminorum (*Pollux*)	39 38 30	10 46	52 S
γ Argûs	64 46 22	11 35	30 N
ε Argûs	74 36 52	11 29	22 N
δ Argûs	73 45 35	11 33	28 N
β Argûs	85 11 50	11 27	18 N
α Leonis (*Regulus*)	69 58 34	9 26	77 S
α Ursæ Majoris (*Dubhe*)	81 52 49	11 8	27 S
α Crucis	102 34 49	11 34	27 N
γ Crucis	104 15 16	11 37	33 N
β Crucis	105 48 19	11 35	30 N
ε Ursæ Majoris (*Alioth*)	96 49 8	11 6	30 S
η Ursæ Majoris (*Benetnasch*)	107 3 35	11 4	32 S
β Centauri	114 11 36	11 32	26 N
α Trianguli Australis	117 2 1	11 22	4 N
α Pavonis	118 29 49	11 8	27 S
α Cygni (*Deneb*)	112 18 14	11 39	35 N
α Gruis	107 42 49	10 57	41 S
α Piscis Australis (*Fomalhaut*)	99 6 3	10 37	59 S
β Tauri. (*Nath*) 5h 20m. N. 28° 32′. and :—			
ε Orionis (*Alnilam*)	29 54 31	11 30	5 N
ζ Orionis	30 45 4	11 35	7 N
α Orionis (*Betelguese*)	22 16 23	11 58	18 N
β Canis Majoris (*Mirzam*)	48 31 22	11 52	16 N
γ Geminorum (*Alhena*)	20 28 37	13 47	48 N
ε Canis Majoris (*Adara*)	61 40 8	12 7	21 N
δ Canis Majoris	60 12 55	12 14	23 N
α Geminorum (*Castor*)	27 48 25	7 22	57 S
β Geminorum (*Pollux*)	30 30 36	18 26	60 N
γ Argûs	84 22 5	12 17	24 N
ε Argûs	95 18 38	12 2	19 N
δ Argûs	93 33 45	12 17	24 N
β Argûs	106 23 53	11 57	16 N
α Leonis (*Regulus*)	67 19 12	17 41	61 N
α Ursæ Majoris (*Dubhe*)	62 26 34	10 14	27 S
ε Ursæ Majoris (*Alioth*)	77 41 5	10 14	27 S
η Ursæ Majoris (*Benetnasch*)	88 9 3	10 15	27 S
α Lyræ (*Vega*)	110 37 30	11 48	13 N
α Cygni (*Deneb*)	93 49 34	12 26	28 N
α Piscis Australis (*Fomalhaut*)	109 23 8	8 14	52 S

Star Pair.	Distance.	R.A. and Dec. of Fictitious Star.	
ε Orionis. (*Alnilam*) 5h 31m. S. 1° 16′. and :—	° ′ ″	h m	°
α Orionis (*Betelguese*)	9 49 17	11 35	28 S
β Canis Majoris (*Mirzam*)	20 16 22	11 25	33 N
γ Geminorum (*Alhena*)	23 14 24	11 38	38 S
ε Canis Majoris (*Adara*)	34 0 58	11 28	34 N
δ Canis Majoris	33 32 52	11 29	39 N
α Geminorum (*Castor*)	43 21 58	11 37	37 S
β Geminorum (*Pollux*)	42 35 42	11 39	43 S
γ Argûs	56 50 39	11 29	31 N
ε Argûs	66 34 29	11 29	22 N
δ Argûs	65 47 2	11 29	28 N
β Argûs	77 10 5	11 29	17 N
α Leonis (*Regulus*)	68 49 11	12 1	76 S
α Ursæ Majoris (*Dubhe*)	87 13 51	11 33	26 S
α Crucis	94 35 10	11 29	27 N
γ Crucis	96 23 28	11 29	32 N
β Crucis	97 51 47	11 29	29 N
ε Ursæ Majoris (*Alioth*)	101 45 17	11 32	32 S
α Virginis (*Spica*)	116 25 23	11 2	77 N
η Ursæ Majoris (*Benetnasch*)	111 40 27	11 34	35 S
β Centauri	106 10 26	11 29	25 N
α Trianguli Australis	109 18 16	11 30	5 N
α Pavonis	112 48 46	11 32	23 S
α Gruis	103 54 16	11 35	40 S
α Piscis Australis (*Fomalhaut*)	97 46 43	11 37	58 S
ζ Orionis. 5h 36m. S. 2° 0′. and :—			
α Orionis (*Betelguese*)	10 1 0	11 40	21 S
β Canis Majoris (*Mirzam*)	19 2 4	11 30	32 N
γ Geminorum (*Alhena*)	23 6 42	11 41	35 S
ε Canis Majoris (*Adara*)	32 46 34	11 30	33 N
δ Canis Majoris	32 15 24	11 27	38 N
α Geminorum (*Castor*)	43 16 34	11 39	35 S
β Geminorum (*Pollux*)	42 21 7	11 39	42 S
γ Argûs	55 38 7	11 32	31 N
ε Argûs	65 28 15	11 32	22 N
δ Argûs	64 36 8	11 30	28 N
β Argûs	76 7 56	11 32	17 N
α Leonis (*Regulus*)	67 53 20	12 2	75 S
α Ursæ Majoris (*Dubhe*)	87 21 12	11 38	27 S
α Crucis	93 25 6	11 32	27 N
γ Crucis	95 9 36	11 29	33 N

Look for the Star with the *smaller* R.A. in bold type.

DISTANCES OF THE STAR PAIRS, Etc.

Star Pair.	Distance.	R.A. and Dec. of Fictitious Star.	
ζ Orionis—*continued.*	° ′ ″	h m	°
β Crucis	96 39 49	11 30	30 N
ϵ Ursæ Majoris (*Alioth*)	101 45 48	11 40	32 S
α Virginis (*Spica*)	115 8 53	10 52	77 N
η Ursæ Majoris (*Benetnasch*)	111 35 50	11 41	35 S
β Centauri	105 1 47	11 30	25 N
α Trianguli Australis	108 28 25	11 36	6 N
α Pavonis	112 34 58	11 39	22 S
α Gruis	104 4 45	11 39	39 S
α Piscis Australis (*Fomalhaut*)	98 23 14	11 47	58 S
α Orionis. (*Betelguese*) 5h 50m. N. 7° 23′. and :—			
β Canis Majoris (*Mirzam*)	26 15 26	11 58	15 N
γ Geminorum (*Alhena*)	13 44 39	11 22	44 S
ϵ Canis Majoris (*Adara*)	39 27 36	12 2	22 N
δ Canis Majoris	38 11 2	12 6	28 N
α Geminorum (*Castor*)	33 41 32	11 27	38 S
β Geminorum (*Pollux*)	33 12 49	11 20	47 S
γ Argûs	62 17 21	12 5	25 N
ϵ Argûs	73 2 45	12 0	19 N
δ Argûs	71 27 29	12 5	24 N
β Argûs	84 8 0	11 58	16 N
α Leonis (*Regulus*)	62 27 4	9 37	77 S
α Ursæ Majoris (*Dubhe*)	77 24 37	11 35	27 S
α Crucis	100 9 18	12 5	27 N
γ Crucis	101 5 49	12 10	33 N
β Crucis	103 0 25	12 8	30 N
ϵ Ursæ Majoris (*Alioth*)	91 57 21	11 31	32 S
α Virginis (*Spica*)	113 24 51	14 30	79 N
η Ursæ Majoris (*Benetnasch*)	101 55 50	11 29	34 S
β Centauri	111 54 12	12 5	27 N
α Trianguli Australis	117 25 4	11 52	7 N
α Cygni (*Deneb*)	115 29 50	12 7	31 N
α Gruis	113 30 1	11 25	40 S
α Piscis Australis (*Fomalhaut*)	106 8 18	11 0	59 S
β Canis Majoris. (*Mirzam*) 6h 18m. S. 17° 54′. and :—			
γ Geminorum (*Alhena*)	34 33 16	12 23	5 S
ϵ Canis Majoris (*Adara*)	13 44 37	11 24	34 N
δ Canis Majoris	13 31 4	10 55	46 N
α Geminorum (*Castor*)	52 44 39	12 42	17 S
β Geminorum (*Pollux*)	50 8 55	12 50	22 S

Star Pair.	Distance.	R.A. and Dec. of Fictitious Star.	
β Canis Majoris—*contd.*	° ′ ″	h m	°
γ Argûs	36 37 18	11 34	30 N
ϵ Argûs	46 51 16	11 50	20 N
δ Argûs	45 38 47	11 38	27 N
β Argûs	57 52 37	11 55	16 N
α Leonis (*Regulus*)	63 12 31	14 29	59 S
α Ursæ Majoris (*Dubhe*)	96 51 55	12 50	25 S
α Crucis	74 28 44	11 40	27 N
γ Crucis	76 7 32	11 30	33 N
β Crucis	77 39 15	11 35	30 N
ϵ Ursæ Majoris (*Alioth*)	109 8 46	13 8	33 S
α Virginis (*Spica*)	101 3 6	21 0	67 S
η Ursæ Majoris (*Benetnasch*)	117 16 13	13 23	40 S
β Centauri	86 9 3	11 42	26 N
α Trianguli Australis	91 23 47	12 9	9 N
θ Scorpii	118 9 32	12 6	10 N
α Pavonis	100 59 50	12 39	14 S
α Gruis	97 42 48	13 5	32 S
α Piscis Australis (*Fomalhaut*)	98 29 34	13 49	50 S
γ Geminorum. (*Alhena*) 6h 32m. N. 16° 29′. and :—			
ϵ Canis Majoris (*Adara*)	45 39 11	12 38	7 N
δ Canis Majoris	43 26 18	12 42	10 N
α Geminorum (*Castor*)	20 10 7	11 40	35 S
β Geminorum (*Pollux*)	19 28 10	11 14	46 S
γ Argûs	66 59 0	12 51	17 N
ϵ Argûs	78 50 51	12 42	14 N
δ Argûs	76 3 42	12 50	19 N
β Argûs	90 20 42	12 41	13 N
α Leonis (*Regulus*)	51 7 37	19 17	73 N
α Ursæ Majoris (*Dubhe*)	64 33 10	11 52	26 S
α Crucis	103 20 34	13 10	27 N
γ Crucis	102 50 17	13 17	33 N
β Crucis	105 21 42	13 14	31 N
ϵ Ursæ Majoris (*Alioth*)	78 42 30	11 45	32 S
α Virginis (*Spica*)	104 22 33	17 0	72 N
η Ursæ Majoris (*Benetnasch*)	88 29 9	11 42	36 S
β Centauri	114 48 6	13 11	30 N
α Cygni (*Deneb*)	112 14 3	12 57	23 N
α Piscis Australis (*Fomalhaut*)	119 29 34	10 22	59 S
ϵ Canis Majoris. (*Adara*) 6h 55m. S. 28° 51′. and :—			
δ Canis Majoris	3 21 54	14 23	34 S
α Geminorum (*Castor*)	61 27 43	13 11	7 S
β Geminorum (*Pollux*)	58 5 15	13 18	10 S
γ Argûs	22 56 22	11 42	28 N
ϵ Argûs	33 42 26	12 15	18 N

Look for the Star with the *smaller* R.A. in bold type.

DISTANCES OF THE STAR PAIRS, Etc.

ε Canis Majoris — *contd.*

Star Pair.	Distance.	R.A. and Dec. of Fictitious Star.	
	° ′ ″	h m	°
δ Argûs	32 2 38	11 51	27 N
β Argûs	45 1 41	12 23	15 N
α Leonis (*Regulus*)	61 25 12	15 9	45 S
α Ursæ Majoris (*Dubhe*)	103 9 53	13 42	22 S
α Crucis	60 51 1	11 46	27 N
γ Crucis	62 23 5	11 31	32 N
β Crucis	63 57 1	11 41	30 N
ε Ursæ Majoris (*Alioth*)	113 2 56	14 17	32 S
α Virginis (*Spica*)	90 19 1	20 30	58 S
η Ursæ Majoris (*Benetnasch*)	119 13 10	14 37	38 S
β Centauri	72 33 46	11 47	27 N
α Scorpii (*Antares*)	114 2 59	23 32	32 S
α Trianguli Australis	79 9 14	12 32	11 N
λ Scorpii	110 58 56	12 17	17 N
θ Scorpii	105 38 40	12 20	14 N
ε Sagittarii	116 7 33	12 37	8 N
α Pavonis	92 20 0	13 12	9 S
α Gruis	92 52 38	13 52	25 S
α Piscis Australis (*Fomalhaut*)	98 16 4	14 49	41 S

δ Canis Majoris.

$7^h\ 5^m$.
S. 26° 14′.
and :—

α Geminorum (*Castor*)	58 37 11	13 13	6 S
β Geminorum (*Pollux*)	55 8 30	13 18	9 S
γ Argûs	24 9 10	12 11	25 N
ε Argûs	35 30 44	12 32	16 N
δ Argûs	33 20 54	12 14	24 N
β Argûs	46 57 37	12 36	14 N
α Leonis (*Regulus*)	58 10 2	15 10	46 S
α Ursæ Majoris (*Dubhe*)	99 55 4	13 44	21 S
α Crucis	61 58 16	12 3	27 N
γ Crucis	63 7 53	11 44	33 N
β Crucis	64 53 0	11 52	30 N
ε Ursæ Majoris (*Alioth*)	109 41 19	14 15	32 S
α Virginis (*Spica*)	88 45 33	20 39	62 S
η Ursæ Majoris (*Benetnasch*)	115 52 28	14 38	38 S
β Centauri	73 43 11	12 3	27 N
α Scorpii (*Antares*)	114 45 49	23 37	35 S
α Trianguli Australis	81 14 38	12 39	11 N
λ Scorpii	112 42 26	12 24	18 N
θ Scorpii	107 30 49	12 29	16 N
ε Sagittarii	118 19 44	12 41	10 N
α Pavonis	95 16 50	13 19	8 S
α Gruis	96 11 14	13 54	25 S
α Piscis Australis (*Fomalhaut*)	101 35 34	14 42	41 S

α Geminorum.

(*Castor*) $7^h\ 29^m$.
N. 32° 6′.
and :—

	° ′ ″	h m	°
β Geminorum (*Pollux*)	4 30 47	14 39	27 N
γ Argûs	79 37 1	13 40	5 N
ε Argûs	91 56 20	13 40	5 N
δ Argûs	87 54 11	13 48	9 N
β Argûs	103 11 9	13 45	8 N
α Leonis (*Regulus*)	40 31 42	17 11	52 N
α Ursæ Majoris (*Dubhe*)	44 39 54	12 15	26 S
α Crucis	111 1 35	14 31	24 N
γ Crucis	108 30 53	14 45	28 N
β Crucis	111 39 19	14 42	27 N
ε Ursæ Majoris (*Alioth*)	58 33 43	11 51	33 S
α Virginis (*Spica*)	93 53 58	18 12	56 N
η Ursæ Majoris (*Benetnasch*)	68 19 20	11 39	36 S
α Lyræ (*Vega*)	108 4 10	13 4	10 S
α Cygni (*Deneb*)	101 21 4	13 54	10 N

β Geminorum.

(*Pollux*) $7^h\ 39^m$.
N. 28° 15′.
and :—

γ Argûs	75 33 38	13 50	4 N
ε Argûs	87 52 25	13 51	4 N
δ Argûs	83 42 48	13 57	8 N
β Argûs	99 2 1	13 55	7 N
α Leonis (*Regulus*)	37 2 15	17 28	57 N
α Ursæ Majoris (*Dubhe*)	46 47 2	12 39	25 S
α Crucis	106 31 30	14 32	23 N
γ Crucis	104 0 13	14 46	28 N
β Crucis	107 8 32	14 42	27 N
ε Ursæ Majoris (*Alioth*)	60 3 2	12 15	33 S
α Virginis (*Spica*)	90 50 40	18 5	59 N
η Ursæ Majoris (*Benetnasch*)	69 27 34	12 4	36 S
β Centauri	116 19 45	14 49	29 N
α Lyræ (*Vega*)	111 18 31	13 14	13 S
α Cygni (*Deneb*)	105 35 25	13 59	9 N

γ Argûs.

$8^h\ 7^m$.
S. 47° 3′.
and :—

ε Argûs	12 19 19	13 46	5 N
δ Argûs	9 11 54	12 27	22 N
β Argûs	23 42 12	13 24	10 N
α Leonis (*Regulus*)	64 57 25	15 39	21 S
α Ursæ Majoris (*Dubhe*)	114 32 26	15 7	13 S

Look for the Star with the *smaller* R.A. in bold type.

DISTANCES OF THE STAR PAIRS, Etc.

Star Pair.	Distance.	R.A. and Dec. of Fictitious Star.	
γ Argûs—*continued.*	° ′ ″	h m	°
α Crucis	37 55 1	11 54	27 N
γ Crucis	39 35 22	11 20	33 N
β Crucis	41 1 58	11 36	30 N
ϵ Ursæ Majoris (*Alioth*)	119 6 58	15 56	24 S
α Virginis (*Spica*)	74 19 35	19 58	43 S
β Centauri	49 38 35	11 55	27 N
α Scorpii (*Antares*)	91 10 23	23 28	31 S
α Trianguli Australis	57 53 53	13 10	13 N
λ Scorpii	88 39 22	0 31	21 S
θ Scorpii	83 36 54	0 38	19 S
ϵ Sagittarii	94 55 55	0 57	15 S
α Pavonis	75 52 33	14 8	1 S
α Gruis	82 12 41	15 1	12 S
α Piscis Australis (*Fomalhaut*)	94 15 33	3 50	23 N
ϵ Argûs. 8h 21m. S. 59° 12′. and :—			
δ Argûs	5 39 55	16 20	17 S
β Argûs	11 30 53	12 59	12 N
α Leonis (*Regulus*)	74 35 40	15 48	13 S
α Crucis	28 23 41	10 47	26 N
γ Crucis	31 32 34	22 2	28 S
β Crucis	32 7 51	22 29	27 S
α Virginis (*Spica*)	73 8 31	19 44	30 S
β Centauri	39 41 32	11 12	23 N
α Scorpii (*Antares*)	81 40 53	23 12	23 S
α Trianguli Australis	45 51 7	12 52	12 N
λ Scorpii	77 16 49	0 16	17 S
θ Scorpii	72 0 29	0 28	16 S
ϵ Sagittarii	82 57 57	0 50	13 S
α Pavonis	63 45 20	2 17	1 N
α Gruis	71 21 30	3 22	10 N
α Piscis Australis (*Fomalhaut*)	85 17 51	4 16	14 N
δ Argûs. 8h 42m. S. 54° 22′. and :—			
β Argûs	15 21 12	14 10	7 N
α Leonis (*Regulus*)	68 58 47	15 58	10 S
α Ursæ Majoris (*Dubhe*)	119 37 40	15 39	10 S
α Crucis	28 49 58	11 43	27 N
γ Crucis	30 54 25	10 53	31 N
β Crucis	32 6 21	11 17	29 N
α Virginis (*Spica*)	69 28 13	19 49	35 S
β Centauri	40 31 21	11 49	26 N
α Scorpii (*Antares*)	82 14 14	23 26	29 S
α Trianguli Australis	49 1 53	13 22	14 N

Star Pair.	Distance.	R.A. and Dec. of Fictitious Star.	
δ Argûs—*continued.*	° ′ ″	h m	°
λ Scorpii	79 28 27	0 32	21 S
θ Scorpii	74 28 42	0 44	19 S
ϵ Sagittarii	85 55 57	1 2	16 S
α Pavonis	68 29 37	14 30	3 N
α Gruis	76 49 2	3 27	7 N
α Piscis Australis (*Fomalhaut*)	90 57 40	4 16	16 N
β Argûs. 9h 12m. S. 69° 19′. and :—			
α Leonis (*Regulus*)	82 15 9	15 59	5 S
α Crucis	19 49 20	21 30	21 S
γ Crucis	24 30 15	20 47	21 S
β Crucis	24 0 4	21 20	21 S
α Virginis (*Spica*)	70 21 58	19 35	19 S
β Centauri	29 56 51	22 30	20 S
α Scorpii (*Antares*)	71 33 43	23 0	19 S
α Trianguli Australis	34 20 27	0 58	12 S
λ Scorpii	65 59 14	0 10	15 S
θ Scorpii	60 37 5	0 26	14 S
ϵ Sagittarii	71 27 26	0 49	13 S
α Aquilæ (*Altair*)	117 42 26	1 37	8 S
α Pavonis	53 15 19	2 36	4 S
α Gruis	62 53 15	3 46	3 N
α Piscis Australis (*Fomalhaut*)	78 52 27	4 32	7 N
α Leonis. (*Regulus*) 10h 3m. N. 12° 26′. and :—			
α Ursæ Majoris (*Dubhe*)	50 47 12	15 52	8 S
α Crucis	79 39 4	16 16	15 N
γ Crucis	75 5 4	16 20	19 N
β Crucis	78 27 16	16 22	19 N
ϵ Ursæ Majoris (*Alioth*)	54 22 7	15 34	26 S
α Virginis (*Spica*)	54 3 19	17 50	63 N
η Ursæ Majoris (*Benetnasch*)	58 20 10	15 20	36 S
β Centauri	85 59 36	16 28	25 N
α Scorpii (*Antares*)	99 55 57	17 47	63 N
α Trianguli Australis	104 45 43	16 27	21 N
λ Scorpii	114 6 44	17 17	53 N
θ Scorpii	114 20 8	17 8	46 N
α Lyræ (*Vega*)	109 17 52	15 17	39 S
α Cygni (*Deneb*)	119 28 31	15 48	17 S

Look for the Star with the *smaller* R.A. in bold type.

DISTANCES OF THE STAR PAIRS, Etc.

Star Pair.	Distance.	R.A. and Dec. of Fictitious Star.	
α Ursæ Majoris.			
(*Dubhe*) 10h 58m. N. 62° 16′. and :—	° ′ ″	h m	°
ε Ursæ Majoris (*Alioth*)	15 14 31	22 15	27 N
α Virginis (*Spica*)	77 59 6	19 9	15 N
η Ursæ Majoris (*Benetnasch*)	25 42 29	22 9	27 N
α Scorpii (*Antares*)	109 11 54	21 30	25 N
α Lyræ (*Vega*)	66 3 27	1 46	21 N
α Aquilæ (*Altair*)	100 7 9	1 58	20 N
α Cygni (*Deneb*)	69 12 2	3 27	12 N
α Crucis.			
12h 21m. S. 62° 34′. and :—			
γ Crucis	6 1 9	18 42	3 S
β Crucis	4 14 34	20 32	15 S
ε Ursæ Majoris (*Alioth*)	119 10 38	18 35	2 S
α Virginis (*Spica*)	52 58 51	19 25	8 S
η Ursæ Majoris (*Benetnasch*)	113 32 44	19 12	6 S
β Centauri	11 45 4	0 8	27 S
α Scorpii (*Antares*)	53 28 15	23 17	26 S
α Trianguli Australis	25 51 52	15 22	19 N
λ Scorpii	51 38 5	0 54	27 S
θ Scorpii	47 15 2	1 17	27 S
ε Sagittarii	59 29 58	1 32	26 S
α Aquilæ (*Altair*)	107 19 22	1 28	27 S
α Pavonis	51 30 17	4 5	16 S
α Gruis	66 34 29	4 52	12 S
α Piscis Australis (*Fomalhaut*)	85 36 8	5 10	9 S
γ Crucis.			
12h 26m. S. 56° 35′. and :—			
β Crucis	3 22 20	16 13	20 N
ε Ursæ Majoris (*Alioth*)	113 9 36	18 37	2 S
α Virginis (*Spica*)	47 6 34	19 27	10 S
η Ursæ Majoris (*Benetnasch*)	107 35 15	19 9	7 S
β Centauri	12 23 10	14 25	30 N
α Scorpii (*Antares*)	51 40 28	23 34	33 S
α Trianguli Australis	29 45 35	16 6	21 N
λ Scorpii	52 6 32	1 17	33 S
θ Scorpii	48 18 37	1 42	32 S
ε Sagittarii	60 48 10	1 52	32 S
α Aquilæ (*Altair*)	108 10 20	1 22	33 S
α Pavonis	55 59 16	16 23	18 N
α Gruis	71 46 21	5 2	13 S
α Piscis Australis (*Fomalhaut*)	91 3 7	5 18	12 S

Star Pair.	Distance.	R.A. and Dec. of Fictitious Star.	
β Crucis.			
12h 42m. S. 59° 10′. and :—	° ′ ″	h m	°
ε Ursæ Majoris (*Alioth*)	115 39 18	18 45	1 S
α Virginis (*Spica*)	49 1 51	19 24	6 S
η Ursæ Majoris (*Benetnasch*)	109 40 44	19 17	5 S
β Centauri	9 29 43	13 34	30 N
α Scorpii (*Antares*)	50 9 0	23 26	29 S
α Trianguli Australis	26 23 25	16 4	21 N
λ Scorpii	49 33 21	1 10	31 S
θ Scorpii	45 32 34	1 36	30 S
ε Sagittarii	57 58 44	1 46	30 S
α Aquilæ (*Altair*)	105 33 45	1 27	30 S
α Pavonis	52 37 11	4 23	19 S
α Gruis	68 29 42	5 5	13 S
α Piscis Australis (*Fomalhaut*)	87 50 48	5 20	12 S
ε Ursæ Majoris.			
(*Alioth*) 12h 50m. N. 56° 29′. and :—			
α Virginis (*Spica*)	67 26 9	19 15	4 N
η Ursæ Majoris (*Benetnasch*)	10 27 59	22 10	27 N
β Centauri	117 9 0	19 21	5 N
α Scorpii (*Antares*)	94 11 44	21 32	23 N
λ Scorpii	110 16 14	21 58	26 N
θ Scorpii	115 30 33	21 44	25 N
ε Sagittarii	114 4 39	22 43	29 N
α Lyræ (*Vega*)	56 31 51	2 28	31 N
α Aquilæ (*Altair*)	90 27 6	2 5	32 N
α Cygni (*Deneb*)	65 44 26	4 16	22 N
α Virginis.			
(*Spica*) 13h 20m. S. 10° 40′. and :—			
η Ursæ Majoris (*Benetnasch*)	60 40 27	19 22	4 S
β Centauri	49 43 49	19 13	6 N
α Scorpii (*Antares*)	45 54 16	17 52	62 N
α Trianguli Australis	66 16 25	19 9	17 N
λ Scorpii	61 7 37	18 28	52 N
θ Scorpii	62 46 43	18 38	46 N
ε Sagittarii	71 11 42	18 20	56 N
α Lyræ (*Vega*)	87 46 48	20 8	48 S
α Aquilæ (*Altair*)	97 54 24	23 2	77 S
α Pavonis	88 45 58	18 55	31 N
α Cygni (*Deneb*)	111 16 53	20 6	45 S
α Gruis	107 11 54	18 54	32 N

Look for the Star with the *smaller* R.A. in bold type.

DISTANCES OF THE STAR PAIRS, ETC.

η Ursæ Majoris.

(*Benetnasch*) $13^h\ 44^m$. N. $49°\ 47'$.
and :—

Star Pair.	Distance.	R.A. and Dec. of Fictitious Star.	
	° ′ ″	h m	°
β Centauri	109 44 7	19 45	1 N
α Scorpii (*Antares*)	83 52 45	21 34	22 N
λ Scorpii	99 49 12	22 0	27 N
θ Scorpii	105 6 2	21 49	24 N
ε Sagittarii	103 41 39	22 38	30 N
α Lyræ (*Vega*)	51 0 58	3 8	38 N
α Aquilæ (*Altair*)	83 48 26	2 12	39 N
α Cygni (*Deneb*)	64 24 25	4 52	30 N

β Centauri.

$13^h\ 57^m$. S. $59°\ 55'$.
and :—

α Scorpii (*Antares*)	41 59 22	23 10	23 S
α Trianguli Australis	19 7 40	17 17	21 N
λ Scorpii	40 7 10	1 6	30 S
θ Scorpii	36 2 52	1 40	31 S
ε Sagittarii	48 29 28	1 48	31 S
α Lyræ (*Vega*)	113 41 7	23 8	23 S
α Aquilæ (*Altair*)	96 4 52	1 25	30 S
α Pavonis	45 29 24	4 58	22 S
α Gruis	62 32 48	5 30	20 S
α Piscis Australis (*Fomalhaut*)	82 17 43	5 36	19 S

α Scorpii.

(*Antares*) $16^h\ 24^m$. S. $26°\ 13'$.
and :—

α Trianguli Australis	42 41 28	22 17	2 N
λ Scorpii	17 16 47	20 42	40 N
θ Scorpii	21 34 23	21 12	31 N
ε Sagittarii	25 53 18	19 30	54 N
α Lyræ (*Vega*)	71 41 46	23 8	22 S
α Aquilæ (*Altair*)	60 14 44	0 57	52 S
α Pavonis	51 20 14	21 12	32 N
α Cygni (*Deneb*)	91 44 9	23 39	35 S
α Gruis	67 33 25	20 41	41 N
α Piscis Australis (*Fomalhaut*)	82 51 6	19 52	51 N

α Trianguli Australis.

$16^h\ 39^m$. S. $68°\ 51'$.
and :—

λ Scorpii	32 30 43	23 47	6 S
θ Scorpii	26 47 10	23 57	8 S
ε Sagittarii	37 7 4	0 47	12 S
α Lyræ (*Vega*)	109 39 6	0 2	8 S
α Aquilæ (*Altair*)	84 1 44	1 35	15 S
α Pavonis	26 26 2	4 45	21 S
α Gruis	43 30 17	5 38	21 S
α Piscis Australis (*Fomalhaut*)	63 17 59	5 40	21 S

λ Scorpii.

$17^h\ 27^m$. S. $37°\ 2'$.
and :—

θ Scorpii	5 56 14	23 12	3 N
ε Sagittarii	10 36 23	4 8	52 S
α Lyræ (*Vega*)	77 16 3	23 54	11 S
α Aquilæ (*Altair*)	56 3 50	1 25	33 S
α Pavonis	34 28 55	21 34	31 N
α Cygni (*Deneb*)	92 36 48	0 50	25 S
α Gruis	50 16 42	20 40	41 N
α Piscis Australis (*Fomalhaut*)	66 0 32	7 32	49 S

θ Scorpii.

$17^h\ 30^m$. S. $42°\ 56'$.
and :—

ε Sagittarii	12 32 29	2 11	35 S
α Lyræ (*Vega*)	82 52 56	23 58	9 S
α Aquilæ (*Altair*)	60 5 28	1 25	28 S
α Pavonis	29 46 35	21 10	32 N
α Cygni (*Deneb*)	97 18 44	0 54	22 S
α Gruis	46 33 22	20 16	40 N
α Piscis Australis (*Fomalhaut*)	63 28 17	7 14	43 S

ε Sagittarii.

$18^h\ 18^m$. S. $34°\ 26'$.
and :—

α Lyræ (*Vega*)	73 13 1	0 25	3 S
α Aquilæ (*Altair*)	47 51 10	1 30	25 S
α Pavonis	30 22 20	23 0	26 N
α Cygni (*Deneb*)	85 30 13	1 13	20 S
α Gruis	43 18 44	21 42	42 N
α Piscis Australis (*Fomalhaut*)	57 3 55	8 8	52 S

α Lyræ.

(*Vega*) $18^h\ 34^m$. N. $38°\ 42'$.
and :—

α Aquilæ (*Altair*)	34 11 41	2 2	25 N
α Pavonis	98 14 6	1 7	11 N
α Cygni (*Deneb*)	23 51 20	20 57	45 S
α Gruis	97 49 38	2 0	25 N
α Piscis Australis (*Fomalhaut*)	91 25 50	3 6	38 N

Look for the Star with the *smaller* R.A. in bold type.

DISTANCES OF THE STAR PAIRS, Etc.

Star Pair.	Distance.	R.A. and Dec. of Fictitious Star.	Star Pair.	Distance.	R.A. and Dec. of Fictitious Star.
α Aquilæ.			**α Cygni.**		
(*Altair*) 19h 46m. N. 8° 37′.			(*Deneb*) 20h 38m. N. 44° 56′.		
and :—			and :—		
	° ′ ″	h m °		° ′ ″	h m °
α Pavonis	65 59 7	1 47 4 N	α Gruis	94 11 24	3 17 10 N
α Cygni (*Deneb*)	38 1 39	1 38 15 S	α Piscis Australis (*Fomalhaut*)	81 2 36	4 2 20 N
α Gruis	63 38 2	2 1 25 N			
α Piscis Australis (*Fomalhaut*)	59 9 7	2 22 46 N	**α Gruis.**		
α Pavonis.			22h 2m. S. 47° 25′.		
20h 18m. S. 57° 2′.			and :—		
and :—			α Piscis Australis (*Fomalhaut*)	19 48 33	5 47 22 S
α Cygni (*Deneb*)	102 4 0	2 29 2 S			
α Gruis	18 26 55	6 19 31 S	(*Fomalhaut*) 22h 52m. S. 30° 7′.		
α Piscis Australis (*Fomalhaut*)	37 54 12	6 7 28 S			

Look for the Star with the *smaller* R.A. in bold type.

EX-MERIDIAN STAR PAIRS,
WITH DISTANCES FOR EVERY TEN DAYS.

(See *Introduction*, p. xiv.)

I.

Capella (*α Aurigæ*) and **Rigel** (*β Orionis*).

R.A. $5^h\ 10^m$. R.A. $5^h\ 10^m$
Dec. 45° 54′ N. . Dec. 8° 19′ S.
Mag. 0·2 . Mag. 0·3

Date.		Distance.		
		°	′	″
Jan.	1	54	12	54
	11	54	12	57
	21	54	13	0
	31	54	13	2
Feb.	10	54	13	4
	20	54	13	5
Mar.	1	54	13	5
	11	54	13	5
	21	54	13	5
	31	54	13	4
Apr.	10	54	13	3
	20	54	13	1
	30	54	12	59
May	10	54	12	56
	20	54	12	53
	30	54	12	50
June	9	54	12	47
	19	54	12	44
	29	54	12	41
July	9	54	12	38
	19	54	12	35
	29	54	12	33
Aug.	8	54	12	31
	18	54	12	30
	28	54	12	29
Sept.	7	54	12	28
	17	54	12	28
	27	54	12	29
Oct.	7	54	12	30
	17	54	12	32
	27	54	12	34
Nov.	6	54	12	36
	16	54	12	39
	26	54	12	42
Dec.	6	54	12	46
	16	54	12	49
	26	54	12	52
	36	54	12	55

II.

Mizar (*ζ Ursæ Majoris*) and **Spica** (*α Virginis*).

R.A. $13^h\ 20^m$. R.A. $13^h\ 20^m$
Dec. 55° 25′ N. . Dec. 10° 40′ S.
Mag. 2·1 . Mag. 1·2

Date.		Distance.		
		°	′	″
Jan.	1	66	4	53
	11	66	4	54
	21	66	4	55
	31	66	4	56
Feb.	10	66	4	58
	20	66	5	1
Mar.	1	66	5	4
	11	66	5	7
	21	66	5	10
	31	66	5	13
Apr.	10	66	5	17
	20	66	5	20
	30	66	5	23
May	10	66	5	26
	20	66	5	28
	30	66	5	30
June	9	66	5	31
	19	66	5	32
	29	66	5	32
July	9	66	5	32
	19	66	5	31
	29	66	5	30
Aug.	8	66	5	29
	18	66	5	27
	28	66	5	24
Sept.	7	66	5	21
	17	66	5	18
	27	66	5	15
Oct.	7	66	5	11
	17	66	5	8
	27	66	5	4
Nov.	6	66	5	1
	16	66	4	59
	26	66	4	57
Dec.	6	66	4	55
	16	66	4	54
	26	66	4	53
	36	66	4	53

EX-MERIDIAN STAR PAIRS,

WITH DISTANCES FOR EVERY TEN DAYS.

(See *Introduction*, p. xiv.)

III.

θ Scorpii and α Ophiuchi.

R.A. $17^h\ 30^m$. R.A. $17^h\ 30^m$
Dec. 42° 56′ S. . Dec. 12° 38′ N.
Mag. 2·0 . Mag. 2·1

Date.		Distance.
Jan.	1	55° 33′ 54″
	11	55 33 51
	21	55 33 48
	31	55 33 46
Feb.	10	55 33 43
	20	55 33 42
Mar.	1	55 33 41
	11	55 33 41
	21	55 33 41
	31	55 33 42
Apr.	10	55 33 43
	20	55 33 45
	30	55 33 47
May	10	55 33 49
	20	55 33 52
	30	55 33 55
June	9	55 33 58
	19	55 34 1
	29	55 34 4
July	9	55 34 7
	19	55 34 10
	29	55 34 12
Aug.	8	55 34 14
	18	55 34 16
	28	55 34 17
Sept.	7	55 34 18
	17	55 34 18
	27	55 34 18
Oct.	7	55 34 17
	17	55 34 16
	27	55 34 14
Nov.	6	55 34 11
	16	55 34 9
	26	55 34 6
Dec.	6	55 34 2
	16	55 33 59
	26	55 33 55
	36	55 33 52

IV.

α Pavonis and γ Cygni.

R.A. $20^h\ 18^m$. R.A. $20^h\ 19^m$
Dec. 57° 2′ S. . Dec. 39° 57′ N.
Mag. 2·0 . Mag. 2·3

Date.		Distance.
Jan.	1	96° 59′ 45″
	11	96 59 41
	21	96 59 35
	31	96 59 29
Feb.	10	96 59 24
	20	96 59 19
Mar.	1	96 59 14
	11	96 59 10
	21	96 59 7
	31	96 59 5
Apr.	10	96 59 3
	20	96 59 2
	30	96 59 2
May	10	96 59 3
	20	96 59 5
	30	96 59 7
June	9	96 59 10
	19	96 59 14
	29	96 59 18
July	9	96 59 23
	19	96 59 28
	29	96 59 33
Aug.	8	96 59 38
	18	96 59 43
	28	96 59 47
Sept.	7	96 59 51
	17	96 59 55
	27	96 59 58
Oct.	7	97 0 0
	17	97 0 1
	27	97 0 2
Nov.	6	97 0 2
	16	97 0 1
	26	96 59 59
Dec.	6	96 59 56
	16	96 59 52
	26	96 59 47
	36	96 59 43

EX-MERIDIAN STAR PAIRS,

WITH DISTANCES FOR EVERY TEN DAYS.

(See *Introduction*, p. xiv.)

V.

Polaris (*α Ursæ Minoris*) and **Alpheratz** (*α Andromedæ*).

R.A. $1^h\ 24^m$. R.A. $0^h\ 3^m$
Dec. 88° 48′ N. . Dec. 28° 34′ N.
Mag. 2·1 . Mag. 2·1

Date.		Distance.
Jan.	1	60° 18′ 46″
	11	60 18 46
	21	60 18 46
	31	60 18 46
Feb.	10	60 18 47
	20	60 18 46
Mar.	1	60 18 45
	11	60 18 43
	21	60 18 41
	31	60 18 39
Apr.	10	60 18 37
	20	60 18 35
	30	60 18 33
May	10	60 18 31
	20	60 18 29
	30	60 18 27
June	9	60 18 25
	19	60 18 24
	29	60 18 23
July	9	60 18 22
	19	60 18 21
	29	60 18 21
Aug.	8	60 18 21
	18	60 18 22
	28	60 18 23
Sept.	7	60 18 24
	17	60 18 26
	27	60 18 28
Oct.	7	60 18 30
	17	60 18 33
	27	60 18 35
Nov.	6	60 18 37
	16	60 18 39
	26	60 18 41
Dec.	6	60 18 43
	16	60 18 45
	26	60 18 46
	36	60 18 46

VI.

Polaris (*α Ursæ Minoris*) and **Schedir** (*α Cassiopeiæ*).

R.A. $1^h\ 24^m$. R.A. $0^h\ 35^m$
Dec. 88° 48′ N. . Dec. 56° 1′ N.
Mag. 2·1 . Mag. 2·2—2·8

Date.		Distance.
Jan.	1	32° 48′ 49″
	11	32 48 50
	21	32 48 50
	31	32 48 51
Feb.	10	32 48 51
	20	32 48 51
Mar.	1	32 48 51
	11	32 48 50
	21	32 48 50
	31	32 48 49
Apr.	10	32 48 49
	20	32 48 48
	30	32 48 47
May	10	32 48 46
	20	32 48 45
	30	32 48 44
June	9	32 48 43
	19	32 48 42
	29	32 48 41
July	9	32 48 40
	19	32 48 40
	29	32 48 40
Aug.	8	32 48 39
	18	32 48 39
	28	32 48 39
Sept.	7	32 48 40
	17	32 48 40
	27	32 48 41
Oct.	7	32 48 41
	17	32 48 42
	27	32 48 43
Nov.	6	32 48 44
	16	32 48 45
	26	32 48 46
Dec.	6	32 48 47
	16	32 48 48
	26	32 48 49
	36	32 48 50

EX-MERIDIAN STAR PAIRS,

WITH DISTANCES FOR EVERY TEN DAYS.

(See *Introduction*, p. xiv.)

VII.

Polaris (*α Ursæ Minoris*) and **β Ceti.**

R.A. $1^h\ 24^m$. R.A. $0^h\ 39^m$
Dec. 88° 48′ N. . Dec. 18° 31′ S.
Mag. 2·1 . Mag. 2·2

Date.		Distance.
Jan.	1	107° 20′ 22″
	11	107 20 22
	21	107 20 22
	31	107 20 21
Feb.	10	107 20 20
	20	107 20 17
Mar.	1	107 20 14
	11	107 20 10
	21	107 20 6
	31	107 20 1
Apr.	10	107 19 56
	20	107 19 51
	30	107 19 46
May	10	107 19 41
	20	107 19 37
	30	107 19 33
June	9	107 19 30
	19	107 19 28
	29	107 19 26
July	9	107 19 25
	19	107 19 25
	29	107 19 26
Aug.	8	107 19 27
	18	107 19 29
	28	107 19 32
Sept.	7	107 19 36
	17	107 19 40
	27	107 19 44
Oct.	7	107 19 49
	17	107 19 54
	27	107 19 59
Nov.	6	107 20 4
	16	107 20 9
	26	107 20 13
Dec.	6	107 20 17
	16	107 20 20
	26	107 20 22
	36	107 20 22

VIII.

Polaris (*α Ursæ Minoris*) and **γ Cassiopeiæ.**

R.A. $1^h\ 24^m$. R.A. $0^h\ 51^m$
Dec. 88° 48′ N. . Dec. 60° 12′ N.
Mag. 2·1 . Mag. 2·3

Date.		Distance.
Jan.	1	28° 36′ 43″
	11	28 36 43
	21	28 36 44
	31	28 36 44
Feb.	10	28 36 45
	20	28 36 45
Mar.	1	28 36 45
	11	28 36 45
	21	28 36 44
	31	28 36 44
Apr.	10	28 36 44
	20	28 36 43
	30	28 36 42
May	10	28 36 41
	20	28 36 40
	30	28 36 39
June	9	28 36 38
	19	28 36 38
	29	28 36 37
July	9	28 36 36
	19	28 36 36
	29	28 36 36
Aug.	8	28 36 35
	18	28 36 35
	28	28 36 35
Sept.	7	28 36 35
	17	28 36 36
	27	28 36 36
Oct.	7	28 36 36
	17	28 36 37
	27	28 36 38
Nov.	6	28 36 39
	16	28 36 40
	26	28 36 41
Dec.	6	28 36 42
	16	28 36 42
	26	28 36 43
	36	28 36 43

EX-MERIDIAN STAR PAIRS,
WITH DISTANCES FOR EVERY TEN DAYS.

(See *Introduction*, p. xiv.)

IX.

Polaris (*α Ursæ Minoris*) and **Alamak** (*γ Andromedæ*).

R.A. $1^h\ 24^m$. R.A. $1^h\ 58^m$
Dec. 88° 48′ N. . Dec. 41° 52′ N.
Mag. 2·1 . Mag. 2·2

Date.		Distance.		
		°	′	″
Jan.	1	46	56	27
	11	46	56	29
	21	46	56	30
	31	46	56	30
Feb.	10	46	56	31
	20	46	56	31
Mar.	1	46	56	31
	11	46	56	30
	21	46	56	29
	31	46	56	28
Apr.	10	46	56	26
	20	46	56	25
	30	46	56	23
May	10	46	56	21
	20	46	56	19
	30	46	56	17
June	9	46	56	16
	19	46	56	14
	29	46	56	13
July	9	46	56	11
	19	46	56	10
	29	46	56	9
Aug.	8	46	56	9
	18	46	56	9
	28	46	56	9
Sept.	7	46	56	10
	17	46	56	11
	27	46	56	12
Oct.	7	46	56	13
	17	46	56	14
	27	46	56	16
Nov.	6	46	56	18
	16	46	56	20
	26	46	56	22
Dec.	6	46	56	23
	16	46	56	25
	26	46	56	26
	36	46	56	27

X.

Polaris (*α Ursæ Minoris*) and **Hamel** (*α Arietis*).

R.A. $1^h\ 24^m$. R.A. $2^h\ 2^m$
Dec. 88° 48′ N. . Dec. 23° 1′ N.
Mag. 2·1 . Mag. 2·2

Date.		Distance.		
		°	′	″
Jan.	1	65	48	21
	11	65	48	23
	21	65	48	25
	31	65	48	26
Feb.	10	65	48	26
	20	65	48	26
Mar.	1	65	48	25
	11	65	48	24
	21	65	48	22
	31	65	48	20
Apr.	10	65	48	18
	20	65	48	15
	30	65	48	12
May	10	65	48	9
	20	65	48	6
	30	65	48	3
June	9	65	48	0
	19	65	47	58
	29	65	47	56
July	9	65	47	54
	19	65	47	53
	29	65	47	52
Aug.	8	65	47	52
	18	65	47	52
	28	65	47	52
Sept.	7	65	47	53
	17	65	47	55
	27	65	47	57
Oct.	7	65	47	59
	17	65	48	1
	27	65	48	4
Nov.	6	65	48	7
	16	65	48	10
	26	65	48	13
Dec.	6	65	48	16
	16	65	48	19
	26	65	48	21
	36	65	48	22

EX-MERIDIAN STAR PAIRS,
WITH DISTANCES FOR EVERY TEN DAYS.

(See *Introduction*, p. xiv.)

XI.

Polaris (*α Ursæ Minoris*) and **Alioth** (*ε Ursæ Majoris*).

R.A.	$1^h\ 24^m$	$12^h\ 50^m$
Dec.	88° 48′ N.	56° 29′ N.
Mag.	2·1	1·8

Date.		Distance.		
		°	′	″
Jan.	1	34	42	38
	11	34	42	39
	21	34	42	40
	31	34	42	41
Feb.	10	34	42	42
	20	34	42	43
Mar.	1	34	42	43
	11	34	42	44
	21	34	42	44
	31	34	42	44
Apr.	10	34	42	45
	20	34	42	45
	30	34	42	45
May	10	34	42	45
	20	34	42	44
	30	34	42	44
June	9	34	42	44
	19	34	42	43
	29	34	42	43
July	9	34	42	42
	19	34	42	41
	29	34	42	41
Aug.	8	34	42	40
	18	34	42	39
	28	34	42	38
Sept.	7	34	42	37
	17	34	42	36
	27	34	42	36
Oct.	7	34	42	35
	17	34	42	35
	27	34	42	35
Nov.	6	34	42	35
	16	34	42	35
	26	34	42	35
Dec.	6	34	42	36
	16	34	42	36
	26	34	42	37
	36	34	42	38

XII.

Polaris (*α Ursæ Minoris*) and **Spica** (*α Virginis*).

R.A.	$1^h\ 24^m$	$13^h\ 20^m$
Dec.	88° 48′ N.	10° 40′ S.
Mag.	2·1	1·2

Date.		Distance.		
		°	′	″
Jan.	1	101	51	29
	11	101	51	31
	21	101	51	34
	31	101	51	37
Feb.	10	101	51	41
	20	101	51	45
Mar.	1	101	51	49
	11	101	51	53
	21	101	51	57
	31	101	52	1
Apr.	10	101	52	4
	20	101	52	7
	30	101	52	10
May	10	101	52	12
	20	101	52	14
	30	101	52	16
June	9	101	52	17
	19	101	52	17
	29	101	52	17
July	9	101	52	16
	19	101	52	15
	29	101	52	13
Aug.	8	101	52	10
	18	101	52	7
	28	101	52	4
Sept.	7	101	52	1
	17	101	51	57
	27	101	51	53
Oct.	7	101	51	49
	17	101	51	45
	27	101	51	42
Nov.	6	101	51	39
	16	101	51	36
	26	101	51	34
Dec.	6	101	51	33
	16	101	51	32
	26	101	51	32
	36	101	51	32

EX-MERIDIAN STAR PAIRS,
WITH DISTANCES FOR EVERY TEN DAYS.

(See *Introduction*, p. xiv.)

XIII.

Polaris (*α Ursæ Minoris*) and **Benetnasch** (*η Ursæ Majoris*).

R.A. $1^h\ 24^m$. R.A. $13^h\ 44^m$
Dec. 88° 48′ N. . Dec. 49° 47′ N.
Mag. 2·1 . Mag. 1·9

Date.		Distance.
Jan.	1	41° 24′ 28″
	11	41 24 28
	21	41 24 29
	31	41 24 30
Feb.	10	41 24 31
	20	41 24 32
Mar.	1	41 24 33
	11	41 24 35
	21	41 24 36
	31	41 24 36
Apr.	10	41 24 36
	20	41 24 37
	30	41 24 37
May	10	41 24 37
	20	41 24 37
	30	41 24 36
June	9	41 24 36
	19	41 24 36
	29	41 24 35
July	9	41 24 34
	19	41 24 33
	29	41 24 33
Aug.	8	41 24 32
	18	41 24 31
	28	41 24 30
Sept.	7	41 24 29
	17	41 24 28
	27	41 24 27
Oct.	7	41 24 27
	17	41 24 26
	27	41 24 26
Nov.	6	41 24 25
	16	41 24 25
	26	41 24 25
Dec.	6	41 24 26
	16	41 24 26
	26	41 24 27
	36	41 24 27

XIV.

Polaris (*α Ursæ Minoris*) and *θ* **Centauri**.

R.A. $1^h\ 24^m$. R.A. $14^h\ 1^m$
Dec. 88° 48′ N. . Dec. 35° 54′ S.
Mag. 2·1 . Mag. 2·1

Date.		Distance.
Jan.	1	127° 4′ 45″
	11	127 4 45
	21	127 4 46
	31	127 4 48
Feb.	10	127 4 50
	20	127 4 54
Mar.	1	127 4 58
	11	127 5 3
	21	127 5 8
	31	127 5 13
Apr.	10	127 5 17
	20	127 5 22
	30	127 5 26
May	10	127 5 30
	20	127 5 34
	30	127 5 37
June	9	127 5 40
	19	127 5 42
	29	127 5 43
July	9	127 5 43
	19	127 5 43
	29	127 5 42
Aug.	8	127 5 40
	18	127 5 37
	28	127 5 34
Sept.	7	127 5 30
	17	127 5 26
	27	127 5 21
Oct.	7	127 5 16
	17	127 5 11
	27	127 5 6
Nov.	6	127 5 1
	16	127 4 57
	26	127 4 53
Dec.	6	127 4 50
	16	127 4 48
	26	127 4 46
	36	127 4 45

EX-MERIDIAN STAR PAIRS,
WITH DISTANCES FOR EVERY TEN DAYS.

(See *Introduction*, p. xiv.)

XV.

Achernar (*α Eridani*) and **β Centauri.**

R.A. $1^h\ 34^m$. R.A. $13^h\ 57^m$
Dec. $57°\ 43'$ S. . Dec. $59°\ 55'$ S.
Mag. 0·5 . Mag. 0·8

Date.		Distance.
Jan.	1	62° 16′ 44″
	11	62 16 42
	21	62 16 40
	31	62 16 39
Feb.	10	62 16 38
	20	62 16 37
Mar.	1	62 16 36
	11	62 16 36
	21	62 16 36
	31	62 16 37
Apr.	10	62 16 37
	20	62 16 38
	30	62 16 38
May	10	62 16 39
	20	62 16 40
	30	62 16 41
June	9	62 16 43
	19	62 16 45
	29	62 16 46
July	9	62 16 47
	19	62 16 48
	29	62 16 49
Aug.	8	62 16 50
	18	62 16 51
	28	62 16 52
Sept.	7	62 16 53
	17	62 16 53
	27	62 16 53
Oct.	7	62 16 53
	17	62 16 52
	27	62 16 52
Nov.	6	62 16 52
	16	62 16 51
	26	62 16 50
Dec.	6	62 16 49
	16	62 16 47
	26	62 16 45
	36	62 16 43

XVI.

Mirfak (*α Persei*) and **Alphecca** (*α Coronæ*).

R.A. $3^h\ 17^m$. R.A. $15^h\ 31^m$
Dec. $49°\ 31'$ N. . Dec. $27°\ 2'$ N.
Mag. 1·9 . Mag. 2·3

Date.		Distance.
Jan.	1	103° 23′ 10″
	11	103 23 12
	21	103 23 13
	31	103 23 14
Feb.	10	103 23 15
	20	103 23 16
Mar.	1	103 23 17
	11	103 23 18
	21	103 23 19
	31	103 23 19
Apr.	10	103 23 19
	20	103 23 19
	30	103 23 19
May	10	103 23 18
	20	103 23 18
	30	103 23 17
June	9	103 23 16
	19	103 23 15
	29	103 23 13
July	9	103 23 12
	19	103 23 11
	29	103 23 10
Aug.	8	103 23 9
	18	103 23 7
	28	103 23 6
Sept.	7	103 23 5
	17	103 23 4
	27	103 23 4
Oct.	7	103 23 3
	17	103 23 3
	27	103 23 4
Nov.	6	103 23 4
	16	103 23 5
	26	103 23 6
Dec.	6	103 23 7
	16	103 23 8
	26	103 23 9
	36	103 23 10

EX-MERIDIAN STAR PAIRS,
WITH DISTANCES FOR EVERY TEN DAYS.
(See *Introduction*, p. xiv.)

XVII.

Aldebaran (*α Tauri*) and **α Trianguli Australis.**

R.A. $4^h\ 30^m$. R.A. $16^h\ 39^m$
Dec. 16° 19′ N. . Dec. 68° 51′ S.
Mag. 1·1 . Mag. 1·9

Date.		Distance.
Jan.	1	127° 27′ 9″
	11	127 27 10
	21	127 27 11
	31	127 27 11
Feb.	10	127 27 11
	20	127 27 10
Mar.	1	127 27 9
	11	127 27 8
	21	127 27 7
	31	127 27 5
Apr.	10	127 27 3
	20	127 27 1
	30	127 26 58
May	10	127 26 55
	20	127 26 53
	30	127 26 51
June	9	127 26 49
	19	127 26 47
	29	127 26 46
July	9	127 26 45
	19	127 26 44
	29	127 26 44
Aug.	8	127 26 43
	18	127 26 43
	28	127 26 44
Sept.	7	127 26 45
	17	127 26 46
	27	127 26 47
Oct.	7	127 26 49
	17	127 26 51
	27	127 26 54
Nov.	6	127 26 57
	16	127 26 59
	26	127 27 2
Dec.	6	127 27 4
	16	127 27 6
	26	127 27 8
	36	127 27 9

XVIII.

Alhena (*γ Geminorum*) and **Vega** (*α Lyræ*).

R.A. $6^h\ 32^m$. R.A. $18^h\ 34^m$
Dec. 16° 29′ N. . Dec. 38° 42′ N.
Mag. 1·9 . Mag. 0·1

Date.		Distance.
Jan.	1	124° 49′ 27″
	11	124 49 31
	21	124 49 34
	31	124 49 37
Feb.	10	124 49 39
	20	124 49 41
Mar.	1	124 49 43
	11	124 49 44
	21	124 49 44
	31	124 49 44
Apr.	10	124 49 43
	20	124 49 42
	30	124 49 40
May	10	124 49 38
	20	124 49 35
	30	124 49 32
June	9	124 49 28
	19	124 49 24
	29	124 49 21
July	9	124 49 18
	19	124 49 15
	29	124 49 12
Aug.	8	124 49 9
	18	124 49 7
	28	124 49 5
Sept.	7	124 49 4
	17	124 49 3
	27	124 49 3
Oct.	7	124 49 4
	17	124 49 5
	27	124 49 7
Nov.	6	124 49 9
	16	124 49 11
	26	124 49 14
Dec.	6	124 49 17
	16	124 49 20
	26	124 49 24
	36	124 49 27

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°	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	°
0	6 0	6 0	6 0	6 0	6 0	6 0	6 0	6 0	6 0	6 0	6 0	6 0	6 0	6 0	6 0	6 0	6 0	6 0	6 0	6 0	6 0	6 0	6 0	0
1	6 10	6 9	6 9	6 8	6 8	6 8	6 7	6 7	6 7	6 6	6 6	6 6	6 6	6 6	6 5	6 5	6 5	6 5	6 5	6 4	6 4	6 4	6 4	1
2	6 19	6 18	6 18	6 17	6 16	6 16	6 15	6 14	6 13	6 13	6 12	6 12	6 11	6 11	6 11	6 10	6 10	6 10	6 9	6 9	6 9	6 8	6 8	2
3	6 29	6 27	6 26	6 25	6 24	6 23	6 22	6 21	6 20	6 19	6 19	6 18	6 17	6 17	6 16	6 15	6 15	6 14	6 14	6 13	6 13	6 12	6 12	3
4	6 38	6 36	6 35	6 33	6 32	6 31	6 29	6 28	6 27	6 26	6 25	6 24	6 23	6 22	6 21	6 21	6 20	6 19	6 18	6 18	6 17	6 17	6 16	4
5	6 48	6 45	6 43	6 41	6 40	6 38	6 36	6 35	6 33	6 32	6 31	6 30	6 29	6 28	6 27	6 26	6 25	6 24	6 23	6 22	6 22	6 21	6 20	5
6	6 58	6 55	6 52	6 50	6 48	6 46	6 44	6 42	6 40	6 39	6 37	6 36	6 35	6 33	6 32	6 31	6 30	6 29	6 28	6 27	6 26	6 25	6 24	6
7	7 7	7 4	7 1	6 58	6 56	6 53	6 51	6 49	6 47	6 45	6 44	6 42	6 40	6 39	6 38	6 36	6 35	6 34	6 32	6 31	6 30	6 29	6 28	7
8	7 17	7 14	7 10	7 7	7 4	7 1	6 59	6 56	6 54	6 52	6 50	6 48	6 46	6 45	6 43	6 41	6 40	6 39	6 37	6 36	6 35	6 33	6 32	8
9	7 28	7 23	7 19	7 16	7 12	7 9	7 6	7 4	7 1	6 59	6 56	6 54	6 52	6 50	6 49	6 47	6 45	6 44	6 42	6 41	6 39	6 38	6 36	9
10	7 38	7 33	7 29	7 25	7 21	7 17	7 14	7 11	7 8	7 6	7 3	7 1	6 58	6 56	6 54	6 52	6 50	6 49	6 47	6 45	6 44	6 42	6 41	10
11	7 49	7 44	7 39	7 34	7 30	7 26	7 22	7 19	7 16	7 12	7 10	7 7	7 4	7 2	7 0	6 58	6 56	6 54	6 52	6 50	6 48	6 46	6 45	11
12	8 0	7 54	7 48	7 43	7 39	7 34	7 30	7 26	7 23	7 20	7 16	7 13	7 11	7 8	7 6	7 3	7 1	6 59	6 57	6 55	6 53	6 51	6 49	12
13	8 12	8 5	7 59	7 53	7 48	7 43	7 38	7 34	7 30	7 27	7 23	7 20	7 17	7 14	7 11	7 9	7 6	7 4	7 2	6 59	6 57	6 55	6 53	13
14	8 24	8 16	8 9	8 3	7 57	7 52	7 47	7 42	7 38	7 34	7 30	7 27	7 23	7 20	7 17	7 14	7 12	7 9	7 7	7 4	7 2	7 0	6 58	14
15	8 37	8 28	8 20	8 13	8 7	8 1	7 56	7 51	7 46	7 42	7 37	7 34	7 30	7 27	7 23	7 20	7 17	7 14	7 12	7 9	7 7	7 4	7 2	15
16	8 50	8 40	8 32	8 24	8 17	8 11	8 5	7 59	7 54	7 49	7 45	7 41	7 37	7 33	7 29	7 26	7 23	7 20	7 17	7 14	7 12	7 9	7 7	16
17	9 4	8 53	8 44	8 35	8 27	8 21	8 14	8 8	8 2	7 57	7 52	7 48	7 44	7 40	7 36	7 32	7 29	7 25	7 22	7 19	7 17	7 14	7 11	17
18	9 20	9 7	8 57	8 47	8 38	8 31	8 24	8 17	8 11	8 5	8 0	7 55	7 51	7 46	7 42	7 38	7 35	7 31	7 28	7 25	7 22	7 19	7 16	18
19	9 37	9 23	9 10	9 0	8 50	8 42	8 34	8 26	8 20	8 14	8 8	8 3	7 58	7 53	7 49	7 45	7 41	7 37	7 33	7 30	7 27	7 24	7 21	19
20	9 56	9 39	9 25	9 13	9 2	8 53	8 44	8 36	8 29	8 22	8 16	8 11	8 5	8 0	7 56	7 51	7 47	7 43	7 39	7 35	7 32	7 29	7 25	20
21	10 19	9 58	9 42	9 28	9 16	9 5	8 55	8 47	8 39	8 32	8 25	8 19	8 13	8 8	8 3	7 58	7 53	7 49	7 45	7 41	7 37	7 34	7 30	21
22	10 49	10 21	10 0	9 44	9 30	9 18	9 7	8 58	8 49	8 41	8 34	8 27	8 21	8 15	8 10	8 5	8 0	7 55	7 51	7 47	7 43	7 39	7 35	22
23	12 0	10 50	10 22	10 2	9 46	9 32	9 20	9 9	9 0	8 51	8 43	8 36	8 29	8 23	8 17	8 12	8 6	8 2	7 57	7 53	7 48	7 44	7 40	23
		12 0	10 51	10 24	10 4	9 47	9 34	9 22	9 11	9 2	8 53	8 45	8 38	8 31	8 25	8 19	8 13	8 8	8 3	7 59	7 54	7 50	7 46	24
			12 0	10 52	10 25	10 5	9 49	9 35	9 24	9 13	9 4	8 55	8 47	8 40	8 33	8 27	8 21	8 15	8 10	8 5	8 0	7 55	7 51	25
			12 0	10 53	10 26	10 6	9 51	9 37	9 25	9 15	9 5	8 57	8 49	8 41	8 35	8 28	8 22	8 17	8 11	8 6	8 1	7 57	26
				12 0	10 53	10 27	10 8	9 52	9 38	9 27	9 16	9 7	8 58	8 50	8 43	8 36	8 30	8 24	8 18	8 12	8 7	8 3	27
					12 0	10 54	10 28	10 9	9 53	9 40	9 28	9 18	9 8	9 0	8 52	8 44	8 37	8 31	8 25	8 19	8 14	8 8	28
						12 0	10 55	10 29	10 10	9 54	9 41	9 29	9 19	9 10	9 1	8 53	8 45	8 38	8 32	8 26	8 20	8 15	29
							12 0	10 55	10 30	10 11	9 55	9 42	9 30	9 20	9 11	9 2	8 54	8 46	8 39	8 33	8 27	8 21	30
								12 0	10 56	10 31	10 12	9 56	9 43	9 31	9 21	9 12	9 3	8 55	8 47	8 40	8 34	8 28	31
									12 0	10 57	10 31	10 13	9 57	9 44	9 32	9 22	9 13	9 4	8 56	8 48	8 41	8 35	32
										12 0	10 57	10 32	10 13	9 58	9 45	9 33	9 23	9 13	9 5	8 56	8 49	8 42	33
											12 0	10 58	10 33	10 15	9 59	9 46	9 34	9 24	9 14	9 5	8 57	8 50	34
												12 0	10 58	10 33	10 15	9 59	9 46	9 35	9 24	9 15	9 6	8 58	35
													12 0	10 58	10 34	10 16	10 0	9 47	9 35	9 25	9 15	9 6	36
														12 0	10 59	10 34	10 16	10 0	9 47	9 36	9 25	9 16	37
															12 0	10 59	10 34	10 16	10 1	9 48	9 36	9 26	38
																12 0	10 59	10 35	10 17	10 1	9 48	9 36	39
																	12 0	10 59	10 35	10 17	10 1	9 48	40
																		12 0	11 0	10 35	10 17	10 1	41
																			12 0	11 0	10 35	10 17	42
																				12 0	11 0	10 35	43
																					12 0	11 0	44
																						12 0	45
9	7 32	7 37	7 43	7 50	7 57	8 5	8 14	8 25	8 38	8 53	9 13	9 38	10 16	12 0									
8	7 21	7 26	7 31	7 36	7 43	7 49	7 57	8 7	8 17	8 30	8 46	9 5	9 32	10 10	12 0								
7	7 10	7 15	7 19	7 24	7 29	7 35	7 41	7 49	7 58	8 9	8 21	8 37	8 57	9 23	10 3	12 0							
6	7 0	7 4	7 7	7 11	7 15	7 20	7 26	7 32	7 40	7 48	7 59	8 11	8 26	8 46	9 14	9 56	12 0						
5	6 50	6 53	6 56	6 59	7 2	7 7	7 11	7 16	7 22	7 29	7 37	7 47	7 59	8 14	8 34	9 2	9 45	12 0					
4	6 40	6 42	6 44	6 47	6 50	6 53	6 56	7 1	7 5	7 11	7 17	7 24	7 33	7 45	7 59	8 19	8 47	9 32	12 0				
3	6 30	6 31	6 33	6 35	6 37	6 39	6 42	6 45	6 49	6 53	6 57	7 3	7 9	7 17	7 28	7 41	8 0	8 27	9 14	12 0			
2	6 20	6 21	6 22	6 23	6 25	6 26	6 28	6 30	6 32	6 35	6 38	6 41	6 46	6 51	6 58	7 6	7 18	7 34	8 0	8 47	12 0		
1	6 10	6 10	6 11	6 12	6 12	6 13	6 14	6 15	6 16	6 17	6 19	6 21	6 23	6 25	6 29	6 33	6 38	6 46	6 58	7 18	8 0	12 0	
0	6 0	6 0	6 0	6 0	6 0	6 0	6 0	6 0	6 0	6 0	6 0	6 0	6 0	6 0	6 0	6 0	6 0	6 0	6 0	6 0	6 0	..	°
	° 68	° 69	° 70	° 71	° 72	° 73	° 74	° 75	° 76	° 77	° 78	° 79	° 80	° 81	° 82	° 83	° 84	° 85	° 86	° 87	° 88	° 89	° 90	

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SAME NAME. DECLINATION OR LATITUDE. **SAME NAME.**

Lat. or Dec.	° 45	° 44	° 43	° 42	° 41	° 40	° 39	° 38	° 37	° 36	° 35	° 34	° 33	° 32	° 31	° 30	° 29	° 28	° 27	° 26	° 25	° 24	° 23	Lat. or Dec.
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Enter at top or bottom with the *larger* argument, whether Latitude or Declination, and at side with the *smaller*.

 COPYRIGHT.

SEMIDIURNAL ARCS.

CONTRARY NAME. DECLINATION OR LATITUDE. **CONTRARY NAME.**

Lat. or Dec.	° 67	° 66	° 65	° 64	° 63	° 62	° 61	° 60	° 59	° 58	° 57	° 56	° 55	° 54	° 53	° 52	° 51	° 50	° 49	° 48	° 47	° 46	° 45	Lat. or Dec.
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20	2 4	2 21	2 35	2 47	2 58	3 7	3 16	3 24	3 31	3 38	3 44	3 49	3 55	4 0	4 4	4 9	4 13	4 17	4 21	4 25	4 28	4 31	4 35	20
21	1 41	2 2	2 18	2 32	2 44	2 55	3 5	3 13	3 21	3 28	3 35	3 41	3 47	3 52	3 57	4 2	4 7	4 11	4 15	4 19	4 23	4 26	4 30	21
22	1 11	1 39	2 0	2 16	2 30	2 42	2 53	3 2	3 11	3 19	3 26	3 33	3 39	3 45	3 50	3 55	4 0	4 5	4 9	4 13	4 17	4 21	4 25	22
23	0 0	1 10	1 38	1 58	2 14	2 28	2 40	2 51	3 0	3 9	3 17	3 24	3 31	3 37	3 43	3 48	3 54	3 58	4 3	4 7	4 12	4 16	4 20	23
24		0 0	1 9	1 36	1 56	2 13	2 26	2 38	2 49	2 58	3 7	3 15	3 22	3 29	3 35	3 41	3 47	3 52	3 57	4 1	4 6	4 10	4 14	24
25	° 67		0 0	1 8	1 35	1 55	2 11	2 25	2 36	2 47	2 56	3 5	3 13	3 20	3 27	3 33	3 39	3 45	3 50	3 55	4 0	4 5	4 9	25
26		° 66		0 0	1 7	1 34	1 54	2 9	2 23	2 35	2 45	2 55	3 3	3 11	3 19	3 25	3 32	3 38	3 43	3 49	3 54	3 59	4 3	26
27			° 65		0 0	1 7	1 33	1 52	2 8	2 22	2 33	2 44	2 53	3 2	3 10	3 17	3 24	3 30	3 36	3 42	3 48	3 53	3 57	27
28				° 64	° 63	° 62	1 6	1 32	1 51	2 7	2 20	2 32	2 42	2 52	3 0	3 8	3 16	3 23	3 29	3 35	3 41	3 46	3 52	28
29							0 0	1 5	1 31	1 50	2 6	2 19	2 31	2 41	2 50	2 59	3 7	3 15	3 22	3 28	3 34	3 40	3 45	29
30								0 0	1 5	1 30	1 49	2 5	2 18	2 30	2 40	2 49	2 58	3 6	3 14	3 21	3 27	3 33	3 39	30
31									0 0	1 4	1 29	1 48	2 4	2 17	2 29	2 39	2 48	2 57	3 5	3 13	3 20	3 26	3 32	31
32										0 0	1 3	1 29	1 47	2 3	2 16	2 28	2 38	2 47	2 56	3 4	3 12	3 19	3 25	32
33	° 68	° 69	° 70	° 71	° 72	° 73	° 74	° 75	° 76	° 77	° 78	° 79	° 80	° 81	° 82	° 83	° 84	° 85	° 86	° 87	° 88	° 89	° 90	33
34	0 0	0 0									0 0	1 3	1 28	1 47	2 2	2 15	2 27	2 37	2 47	2 55	3 4	3 11	3 18	34
35	1 13	0 0	0 0									0 0	1 2	1 27	1 45	2 1	2 14	2 26	2 36	2 46	2 55	3 3	3 10	35
36	1 43	1 14	0 0	0 0									0 0	1 2	1 27	1 45	2 1	2 14	2 25	2 36	2 45	2 54	3 2	36
37	2 6	1 45	1 16	0 0	0 0									0 0	1 2	1 26	1 44	2 0	2 13	2 25	2 35	2 45	2 54	37
38	2 26	2 9	1 47	1 17	0 0	0 0									0 0	1 1	1 26	1 44	2 0	2 13	2 24	2 35	2 44	38
39	2 43	2 29	2 11	1 50	1 19	0 0	0 0									0 0	1 1	1 26	1 44	1 59	2 12	2 24	2 34	39
40	2 59	2 47	2 32	2 14	1 52	1 21	0 0	0 0									0 0	1 1	1 25	1 43	1 59	2 12	2 24	40
41	3 14	3 3	2 50	2 36	2 18	1 55	1 23	0 0	0 0									0 0	1 1	1 25	1 43	1 59	2 12	41
42	3 28	3 18	3 7	2 54	2 40	2 21	1 58	1 26	0 0	0 0									0 0	1 1	1 25	1 43	1 59	42
43	3 41	3 32	3 23	3 12	2 59	2 44	2 25	2 2	1 29	0 0	0 0									0 0	1 1	1 25	1 43	43
44	3 53	3 46	3 37	3 28	3 17	3 4	2 49	2 30	2 6	1 32	0 0										0 0	1 1	1 25	44
45	4 5	3 58	3 51	3 43	3 33	3 22	3 9	2 54	2 35	2 11	1 35	0 0										0 0	1 1	45
46	4 17	4 11	4 4	3 57	3 49	3 39	3 28	3 15	3 0	2 41	2 16	1 40	0 0										0 0	46
47	4 28	4 23	4 17	4 10	4 3	3 55	3 46	3 35	3 22	3 7	2 47	2 22	1 44	0 0										47
48	4 39	4 34	4 29	4 24	4 17	4 11	4 3	3 53	3 43	3 30	3 14	2 55	2 28	1 50	0 0									48
49	4 50	4 45	4 41	4 36	4 31	4 25	4 19	4 11	4 2	3 51	3 39	3 23	3 3	2 37	1 57	0 0								49
50	5 0	4 56	4 53	4 49	4 45	4 40	4 34	4 28	4 20	4 12	4 1	3 49	3 34	3 14	2 46	2 4	0 0							50
51	5 10	5 7	5 4	5 1	4 58	4 53	4 49	4 44	4 38	4 31	4 23	4 13	4 1	3 46	3 26	2 58	2 15	0 0						51
52	5 20	5 18	5 16	5 13	5 10	5 7	5 4	4 59	4 55	4 49	4 43	4 36	4 27	4 15	4 1	3 41	3 13	2 28	0 0					52
53	5 30	5 29	5 27	5 25	5 23	5 21	5 18	5 15	5 11	5 7	5 3	4 57	4 51	4 43	4 32	4 19	4 0	3 33	2 46	0 0				53
54	5 40	5 39	5 38	5 37	5 35	5 34	5 32	5 30	5 28	5 25	5 22	5 19	5 14	5 9	5 2	4 54	4 42	4 26	4 0	3 13	0 0			54
55	5 50	5 50	5 49	5 48	5 48	5 47	5 46	5 45	5 44	5 43	5 41	5 39	5 37	5 35	5 31	5 27	5 22	5 14	5 2	4 42	4 0	0 0		55
56	6 0	6 0	6 0	6 0	6 0	6 0	6 0	6 0	6 0	6 0	6 0	6 0	6 0	6 0	6 0	6 0	6 0	6 0	6 0	6 0	6 0	6 0	..	56
°	° 68	° 69	° 70	° 71	° 72	° 73	° 74	° 75	° 76	° 77	° 78	° 79	° 80	° 81	° 82	° 83	° 84	° 85	° 86	° 87	° 88	° 89	° 90	°

Enter at top or bottom with the *larger* argument, whether Latitude or Declination, and at side with the *smaller*.

SEMIDIURNAL ARCS.

CONTRARY NAME. DECLINATION OR LATITUDE. **CONTRARY NAME.**

Lat. or Dec.	° 45	° 44	° 43	° 42	° 41	° 40	° 39	° 38	° 37	° 36	° 35	° 34	° 33	° 32	° 31	° 30	° 29	° 28	° 27	° 26	° 25	° 24	° 23	Lat. or Dec.
°	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	°
0	6 0	6 0	6 0	6 0	6 0	6 0	6 0	6 0	6 0	6 0	6 0	6 0	6 0	6 0	6 0	6 0	6 0	6 0	6 0	6 0	6 0	6 0	6 0	0
1	5 56	5 56	5 56	5 56	5 57	5 57	5 57	5 57	5 57	5 57	5 57	5 57	5 57	5 58	5 58	5 58	5 58	5 58	5 58	5 58	5 58	5 58	5 58	1
2	5 52	5 52	5 53	5 53	5 53	5 53	5 54	5 54	5 54	5 54	5 54	5 55	5 55	5 55	5 55	5 55	5 56	5 56	5 56	5 56	5 56	5 56	5 57	2
3	5 48	5 48	5 49	5 49	5 50	5 50	5 50	5 51	5 51	5 51	5 52	5 52	5 52	5 52	5 53	5 53	5 53	5 54	5 54	5 54	5 54	5 55	5 55	3
4	5 44	5 45	5 45	5 46	5 46	5 47	5 47	5 47	5 48	5 48	5 49	5 49	5 50	5 50	5 50	5 51	5 51	5 51	5 52	5 52	5 53	5 53	5 53	4
5	5 40	5 41	5 41	5 42	5 43	5 43	5 44	5 44	5 45	5 45	5 46	5 46	5 47	5 47	5 48	5 48	5 49	5 49	5 50	5 50	5 51	5 51	5 51	5
6	5 36	5 37	5 38	5 38	5 39	5 40	5 40	5 41	5 42	5 42	5 43	5 44	5 44	5 45	5 46	5 46	5 47	5 47	5 48	5 48	5 49	5 49	5 50	6
7	5 32	5 33	5 34	5 35	5 35	5 36	5 37	5 38	5 39	5 40	5 40	5 41	5 42	5 42	5 43	5 44	5 44	5 45	5 46	5 46	5 47	5 47	5 48	7
8	5 28	5 29	5 30	5 31	5 32	5 33	5 34	5 35	5 36	5 37	5 37	5 38	5 39	5 40	5 41	5 41	5 42	5 43	5 44	5 44	5 45	5 46	5 46	8
9	5 24	5 25	5 26	5 27	5 28	5 29	5 31	5 32	5 33	5 34	5 35	5 35	5 36	5 37	5 38	5 39	5 40	5 41	5 41	5 42	5 43	5 44	5 45	9
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11	5 15	5 17	5 18	5 20	5 21	5 22	5 24	5 25	5 26	5 28	5 29	5 30	5 31	5 32	5 33	5 34	5 35	5 36	5 37	5 38	5 39	5 40	5 41	11
12	5 11	5 13	5 14	5 16	5 17	5 19	5 20	5 22	5 23	5 24	5 26	5 27	5 28	5 29	5 31	5 32	5 33	5 34	5 35	5 36	5 37	5 38	5 39	12
13	5 7	5 8	5 10	5 12	5 14	5 15	5 17	5 18	5 20	5 21	5 23	5 24	5 26	5 27	5 28	5 29	5 31	5 32	5 33	5 34	5 35	5 36	5 38	13
14	5 2	5 4	5 6	5 8	5 10	5 12	5 13	5 15	5 17	5 18	5 20	5 21	5 23	5 24	5 26	5 27	5 28	5 30	5 31	5 32	5 33	5 35	5 36	14
15	4 58	5 0	5 2	5 4	5 6	5 8	5 10	5 12	5 13	5 15	5 17	5 18	5 20	5 21	5 23	5 24	5 26	5 27	5 29	5 30	5 31	5 33	5 34	15
16	4 53	4 56	4 58	5 0	5 2	5 4	5 6	5 8	5 10	5 12	5 14	5 15	5 17	5 19	5 20	5 22	5 23	5 25	5 26	5 28	5 29	5 31	5 32	16
17	4 49	4 51	4 54	4 56	4 58	5 1	5 3	5 5	5 7	5 9	5 11	5 12	5 14	5 16	5 18	5 19	5 21	5 23	5 24	5 26	5 27	5 29	5 30	17
18	4 44	4 47	4 49	4 52	4 54	4 57	4 59	5 1	5 3	5 5	5 7	5 9	5 11	5 13	5 15	5 17	5 18	5 20	5 22	5 24	5 25	5 27	5 28	18
19	4 39	4 42	4 45	4 48	4 50	4 53	4 55	4 58	5 0	5 2	5 4	5 6	5 8	5 10	5 12	5 14	5 16	5 18	5 20	5 21	5 23	5 25	5 26	19
20	4 35	4 38	4 41	4 43	4 46	4 49	4 51	4 54	4 56	4 59	5 1	5 3	5 5	5 7	5 9	5 11	5 13	5 15	5 17	5 19	5 21	5 23	5 24	20
21	4 30	4 33	4 36	4 39	4 42	4 45	4 48	4 50	4 53	4 55	4 58	5 0	5 2	5 4	5 7	5 9	5 11	5 13	5 15	5 17	5 19	5 21	5 22	21
22	4 25	4 28	4 31	4 35	4 38	4 41	4 44	4 46	4 49	4 52	4 54	4 57	4 59	5 2	5 4	5 6	5 8	5 10	5 12	5 15	5 17	5 19	5 21	22
23	4 20	4 23	4 27	4 30	4 33	4 37	4 40	4 43	4 45	4 48	4 51	4 53	4 56	4 58	5 1	5 3	5 6	5 8	5 10	5 12	5 14	5 16	5 18	23
24	4 14	4 18	4 22	4 25	4 29	4 33	4 36	4 39	4 42	4 44	4 47	4 50	4 53	4 55	4 58	5 0	5 3	5 5	5 7	5 9	5 12	5 14		
25	4 9	4 13	4 17	4 21	4 24	4 28	4 31	4 35	4 38	4 41	4 44	4 47	4 50	4 52	4 55	4 58	5 0	5 2	5 5	5 7	5 10		° 23	
26	4 3	4 8	4 12	4 16	4 20	4 24	4 27	4 31	4 34	4 37	4 40	4 43	4 46	4 49	4 52	4 55	4 57	4 59	5 2	5 5		° 24		
27	3 57	4 2	4 6	4 11	4 15	4 19	4 23	4 26	4 30	4 33	4 36	4 40	4 43	4 46	4 49	4 52	4 54	4 57	5 0		° 25			
28	3 52	3 56	4 1	4 6	4 10	4 14	4 18	4 22	4 26	4 29	4 32	4 36	4 39	4 43	4 46	4 48	4 51	4 54		° 26				
29	3 45	3 50	3 55	4 0	4 4	4 9	4 13	4 17	4 21	4 24	4 28	4 32	4 36	4 39	4 42	4 45	4 48		° 27					
30	3 39	3 44	3 50	3 55	3 59	4 4	4 8	4 12	4 16	4 20	4 24	4 28	4 32	4 35	4 38	4 42		° 28						
31	3 32	3 38	3 44	3 49	3 54	3 59	4 3	4 8	4 12	4 16	4 20	4 24	4 28	4 32	4 35		° 29							
32	3 25	3 31	3 37	3 43	3 48	3 53	3 58	4 3	4 7	4 12	4 16	4 20	4 24	4 28		° 30								
33	3 18	3 25	3 31	3 37	3 42	3 47	3 53	3 58	4 3	4 7	4 12	4 16	4 20		° 31									
34	3 10	3 17	3 24	3 30	3 36	3 42	3 47	3 52	3 58	4 3	4 8	4 12		° 32										
35	3 2	3 10	3 17	3 24	3 30	3 36	3 42	3 47	3 53	3 58	4 3		° 33											
36	2 54	3 2	3 9	3 17	3 23	3 29	3 36	3 42	3 47	3 53		° 34												
37	2 44	2 53	3 1	3 9	3 16	3 23	3 30	3 36	3 42		° 35													
38	2 34	2 44	2 53	3 1	3 9	3 16	3 23	3 30		° 36														
39	2 24	2 34	2 44	2 53	3 1	3 9	3 16		° 37															
40	2 12	2 24	2 34	2 44	2 53	3 1		° 38																
41	1 59	2 12	2 23	2 34	2 44		° 39																	
42	1 43	1 58	2 12	2 23		° 40																		
43	1 25	1 43	1 58		° 41																			
44	1 0	1 25		° 42																				
45	0 0		° 43																					
		° 44																						
	° 45																							
							° 6	° 7	° 8	° 9	° 10	° 11	° 12	° 13	° 14	° 15	° 16	° 17	° 18	° 19	° 20	° 21	° 22	
						° 5	5 54	5 54	5 53	5 53	5 52	5 51	5 50	5 50	5 49	5 48	5 47	5 47	5 46	5 45	9			
					° 4	5 55	5 55	5 54	5 54	5 53	5 53	5 52	5 51	5 51	5 50	5 49	5 48	5 48	5 47	5 47	8			
				° 3	5 57	5 56	5 56	5 55	5 55	5 54	5 54	5 53	5 52	5 52	5 51	5 50	5 49	5 49	5 48	7				
			° 2	5 58	5 57	5 57	5 57	5 56	5 56	5 55	5 55	5 54	5 53	5 53	5 52	5 51	5 50	5 50	6					
		° 1	5 59	5 58	5 58	5 58	5 58	5 57	5 57	5 56	5 56	5 55	5 54	5 54	5 53	5 52	5 51	5						
	° 0	5 59	5 59	5 59	5 59	5 59	5 59	5 58	5 58	5 57	5 57	5 56	5 56	5 55	5 55	5 54	4							
°	6 0	6 0	6 0	6 0	6 0	6 0	6 0	6 0	6 0	6 0	6 0	6 0	6 0	6 0	6 0	6 0	6 0	6 0	6 0	6 0	6 0	6 0	6 0	°
	° 0	° 1	° 2	° 3	° 4	° 5	° 6	° 7	° 8	° 9	° 10	° 11	° 12	° 13	° 14	° 15	° 16	° 17	° 18	° 19	° 20	° 21	° 22	

Enter at top or bottom with the *larger* argument, whether Latitude or Declination, and at side with the *smaller*.

ASTRONOMICAL REFRACTION.

Apparent Altitude.	Height of the Barometer (inches) diminished by one-tenth of the Thermometer (degrees Fahr.).										
	20	21	22	23	24	25	26	27	28	29	30
° ′	′ ″	′ ″	′ ″	′ ″	′ ″	′ ″	′ ″	′ ″	′ ″	′ ″	′ ″
0 0	28 41	29 48	30 57	32 7	33 19	34 32	35 46	37 2	38 19	39 38	40 58
10	26 59	28 2	29 6	30 11	31 17	32 25	33 34	34 44	35 56	37 9	38 23
20	25 31	26 29	27 28	28 28	29 30	30 33	31 37	32 42	33 48	34 56	36 5
30	24 10	25 4	25 59	26 55	27 52	28 50	29 49	30 49	31 51	32 54	33 58
40	22 54	23 44	24 36	25 27	26 20	27 14	28 9	29 5	30 2	31 1	32 1
50	21 45	22 32	23 20	24 8	24 57	25 47	26 38	27 30	28 23	29 18	30 14
1 0	20 43	21 26	22 10	22 55	23 41	24 27	25 14	26 3	26 53	27 44	28 36
10	19 45	20 25	21 6	21 48	22 30	23 13	23 57	24 42	25 29	26 17	27 6
20	18 49	19 27	20 5	20 44	21 24	22 5	22 47	23 30	24 14	24 59	25 45
30	17 58	18 33	19 9	19 46	20 24	21 3	21 43	22 23	23 4	23 46	24 29
40	17 10	17 43	18 17	18 52	19 28	20 5	20 42	21 20	21 59	22 39	23 20
50	16 24	16 56	17 29	18 2	18 36	19 11	19 46	20 22	20 59	21 37	22 15
2 0	15 42	16 13	16 44	17 16	17 48	18 21	18 55	19 29	20 4	20 40	21 16
10	15 4	15 33	16 3	16 33	17 4	17 35	18 7	18 40	19 13	19 47	20 21
20	14 28	14 56	15 24	15 53	16 22	16 52	17 22	17 53	18 25	18 57	19 30
30	13 54	14 21	14 48	15 15	15 43	16 12	16 41	17 11	17 41	18 12	18 43
40	13 23	13 49	14 15	14 41	15 8	15 35	16 3	16 31	17 0	17 29	17 59
50	12 54	13 19	13 44	14 9	14 34	15 0	15 27	15 54	16 21	16 49	17 17
3 0	12 26	12 50	13 14	13 38	14 2	14 27	14 52	15 18	15 44	16 11	16 38
10	12 0	12 23	12 45	13 8	13 32	13 56	14 20	14 45	15 10	15 35	16 1
20	11 35	11 57	12 19	12 41	13 4	13 27	13 50	14 14	14 38	15 2	15 27
30	11 13	11 34	11 55	12 16	12 38	13 0	13 22	13 45	14 8	14 32	14 56
40	10 51	11 11	11 31	11 52	12 13	12 34	12 56	13 18	13 40	14 3	14 26
50	10 31	10 50	11 9	11 29	11 49	12 10	12 31	12 52	13 14	13 36	13 58
4 0	10 12	10 30	10 49	11 8	11 27	11 47	12 7	12 28	12 49	13 10	13 31
10	9 54	10 12	10 30	10 48	11 7	11 26	11 46	12 6	12 26	12 46	13 6
20	9 37	9 54	10 12	10 30	10 48	11 6	11 25	11 44	12 3	12 23	12 42
30	9 20	9 37	9 54	10 11	10 29	10 46	11 5	11 23	11 42	12 1	12 20
40	9 5	9 21	9 37	9 54	10 11	10 28	10 46	11 4	11 22	11 41	12 0
50	8 50	9 6	9 22	9 38	9 54	10 11	10 28	10 45	11 3	11 21	11 39
5 0	8 35	8 50	9 6	9 22	9 38	9 54	10 11	10 28	10 45	11 2	11 19
10	8 21	8 36	8 51	9 7	9 22	9 38	9 54	10 11	10 27	10 44	11 1
20	8 8	8 23	8 38	8 53	9 8	9 23	9 39	9 55	10 11	10 27	10 44
30	7 56	8 10	8 25	8 39	8 54	9 9	9 24	9 40	9 55	10 11	10 27
40	7 44	7 58	8 12	8 26	8 40	8 55	9 10	9 25	9 40	9 55	10 11
50	7 33	7 46	8 0	8 14	8 28	8 42	8 57	9 11	9 26	9 41	9 56
6 0	7 23	7 36	7 50	8 3	8 16	8 30	8 44	8 58	9 13	9 27	9 42
10	7 13	7 26	7 39	7 52	8 5	8 18	8 32	8 46	9 0	9 14	9 28
20	7 3	7 15	7 28	7 41	7 54	8 7	8 20	8 34	8 48	9 2	9 16
30	6 54	7 6	7 18	7 31	7 43	7 56	8 9	8 23	8 36	8 49	9 3
40	6 44	6 56	7 8	7 20	7 32	7 45	7 58	8 11	8 24	8 37	8 50
50	6 36	6 47	6 59	7 11	7 23	7 35	7 47	8 0	8 13	8 26	8 39
7 0	6 27	6 38	6 50	7 1	7 13	7 25	7 37	7 50	8 2	8 14	8 27
10	6 19	6 30	6 42	6 53	7 4	7 16	7 28	7 40	7 52	8 4	8 17
20	6 12	6 23	6 34	6 45	6 56	7 7	7 19	7 31	7 43	7 55	8 7
30	6 5	6 15	6 26	6 37	6 48	6 59	7 10	7 22	7 34	7 46	7 58
40	5 57	6 7	6 18	6 28	6 39	6 50	7 1	7 13	7 24	7 36	7 48
50	5 50	6 0	6 10	6 21	6 31	6 42	6 53	7 4	7 15	7 26	7 38
8 0	5 44	5 54	6 4	6 14	6 24	6 35	6 46	6 56	7 7	7 18	7 30
10	5 37	5 47	5 57	6 7	6 17	6 27	6 37	6 47	6 58	7 9	7 21
20	5 31	5 40	5 50	6 0	6 10	6 20	6 30	6 40	6 51	7 2	7 13
30	5 25	5 34	5 44	5 53	6 3	6 13	6 23	6 33	6 44	6 54	7 5
40	5 20	5 29	5 38	5 48	5 57	6 7	6 17	6 27	6 37	6 47	6 58
50	5 14	5 23	5 32	5 41	5 50	6 0	6 10	6 20	6 30	6 40	6 50
9 0	5 9	5 18	5 27	5 36	5 45	5 54	6 4	6 13	6 23	6 33	6 43
10	5 4	5 12	5 21	5 30	5 39	5 48	5 57	6 7	6 16	6 26	6 36
20	4 58	5 6	5 15	5 24	5 33	5 42	5 51	6 0	6 10	6 19	6 29
30	4 53	5 1	5 10	5 19	5 27	5 36	5 45	5 54	6 3	6 12	6 22
40	4 49	4 57	5 6	5 14	5 22	5 31	5 40	5 49	5 58	6 7	6 16
50	4 44	4 52	5 0	5 8	5 16	5 25	5 34	5 43	5 52	6 1	6 10
10 0	4 39	4 47	4 55	5 3	5 11	5 20	5 29	5 37	5 46	5 55	6 4

ASTRONOMICAL REFRACTION.

Apparent Altitude.	Height of the Barometer (inches) diminished by one-tenth of the Thermometer (degrees Fahr.).										
	20	21	22	23	24	25	26	27	28	29	30
° ′	′ ″	′ ″	′ ″	′ ″	′ ″	′ ″	′ ″	′ ″	′ ″	′ ″	′ ″
10 0	4 39	4 47	4 55	5 3	5 11	5 20	5 29	5 37	5 46	5 55	6 4
10	4 35	4 43	4 51	4 59	5 7	5 15	5 24	5 32	5 41	5 49	5 58
20	4 31	4 38	4 46	4 54	5 2	5 10	5 18	5 27	5 35	5 43	5 52
30	4 27	4 34	4 42	4 50	4 58	5 6	5 14	5 22	5 30	5 38	5 47
40	4 22	4 29	4 37	4 45	4 53	5 1	5 9	5 17	5 25	5 33	5 42
50	4 18	4 25	4 33	4 40	4 48	4 56	5 4	5 12	5 20	5 28	5 36
11 0	4 14	4 21	4 29	4 36	4 44	4 52	5 0	5 7	5 15	5 23	5 31
10	4 11	4 18	4 26	4 33	4 40	4 48	4 56	5 3	5 11	5 19	5 27
20	4 8	4 15	4 22	4 29	4 36	4 44	4 52	4 59	5 7	5 15	5 23
30	4 4	4 11	4 18	4 25	4 32	4 40	4 48	4 55	5 3	5 10	5 18
40	4 1	4 8	4 15	4 22	4 29	4 36	4 44	4 51	4 59	5 6	5 14
50	3 58	4 4	4 11	4 18	4 25	4 32	4 39	4 47	4 54	5 1	5 9
12 0	3 55	4 1	4 8	4 14	4 21	4 28	4 35	4 42	4 50	4 57	5 4
10	3 52	3 58	4 5	4 11	4 18	4 25	4 32	4 39	4 46	4 53	5 0
20	3 48	3 54	4 1	4 7	4 14	4 21	4 28	4 35	4 42	4 49	4 56
30	3 45	3 51	3 58	4 4	4 11	4 18	4 24	4 31	4 38	4 45	4 52
40	3 42	3 48	3 55	4 1	4 7	4 14	4 20	4 27	4 34	4 41	4 48
50	3 40	3 46	3 52	3 58	4 4	4 11	4 18	4 24	4 30	4 37	4 44
13 0	3 37	3 43	3 49	3 55	4 1	4 8	4 15	4 21	4 27	4 34	4 41
10	3 34	3 40	3 46	3 52	3 58	4 5	4 12	4 18	4 24	4 31	4 38
20	3 32	3 38	3 44	3 50	3 56	4 2	4 8	4 15	4 21	4 27	4 34
30	3 29	3 35	3 41	3 47	3 53	3 59	4 5	4 12	4 18	4 24	4 31
40	3 27	3 32	3 38	3 44	3 50	3 56	4 2	4 8	4 14	4 20	4 27
50	3 24	3 29	3 35	3 41	3 47	3 53	3 59	4 5	4 11	4 17	4 24
14 0	3 21	3 26	3 32	3 38	3 44	3 50	3 56	4 2	4 8	4 14	4 21
10	3 19	3 24	3 30	3 35	3 41	3 47	3 53	3 59	4 5	4 11	4 18
20	3 17	3 22	3 28	3 33	3 39	3 45	3 51	3 57	4 3	4 9	4 15
30	3 15	3 20	3 26	3 31	3 36	3 42	3 48	3 54	4 0	4 6	4 12
40	3 13	3 18	3 24	3 29	3 34	3 40	3 46	3 51	3 57	4 3	4 9
50	3 10	3 15	3 21	3 26	3 31	3 37	3 43	3 48	3 54	4 0	4 6
15 0	3 8	3 13	3 19	3 24	3 29	3 35	3 41	3 46	3 52	3 57	4 3
10	3 6	3 11	3 16	3 21	3 26	3 32	3 38	3 43	3 49	3 54	4 0
20	3 4	3 9	3 14	3 19	3 24	3 30	3 36	3 41	3 47	3 52	3 58
30	3 2	3 7	3 12	3 17	3 22	3 28	3 33	3 39	3 44	3 49	3 55
40	3 0	3 5	3 10	3 15	3 20	3 25	3 30	3 36	3 41	3 46	3 52
50	2 58	3 3	3 8	3 13	3 18	3 23	3 28	3 34	3 39	3 44	3 50
16 0	2 56	3 1	3 6	3 11	3 16	3 21	3 26	3 32	3 37	3 42	3 48
10	2 54	2 59	3 4	3 9	3 14	3 19	3 24	3 30	3 35	3 40	3 46
20	2 52	2 57	3 2	3 7	3 12	3 17	3 22	3 27	3 32	3 37	3 43
30	2 51	2 55	3 0	3 5	3 10	3 15	3 20	3 25	3 30	3 35	3 41
40	2 49	2 53	2 58	3 3	3 8	3 13	3 18	3 23	3 28	3 33	3 39
50	2 47	2 51	2 56	3 1	3 6	3 11	3 16	3 21	3 26	3 31	3 36
17 0	2 45	2 49	2 54	2 59	3 4	3 9	3 14	3 19	3 24	3 29	3 34
10	2 44	2 48	2 53	2 57	3 2	3 7	3 12	3 17	3 22	3 27	3 32
20	2 42	2 46	2 51	2 55	3 0	3 5	3 10	3 15	3 20	3 25	3 30
30	2 40	2 44	2 49	2 53	2 58	3 3	3 8	3 12	3 17	3 22	3 27
40	2 38	2 42	2 47	2 51	2 56	3 1	3 6	3 10	3 15	3 20	3 25
50	2 37	2 41	2 46	2 50	2 55	3 0	3 5	3 9	3 14	3 19	3 24
18 0	2 36	2 40	2 45	2 49	2 53	2 58	3 3	3 7	3 12	3 17	3 22
10	2 34	2 38	2 43	2 47	2 51	2 56	3 1	3 5	3 10	3 15	3 20
20	2 33	2 37	2 42	2 46	2 50	2 55	3 0	3 4	3 9	3 13	3 18
30	2 31	2 35	2 40	2 44	2 48	2 53	2 58	3 2	3 7	3 11	3 16
40	2 30	2 34	2 38	2 42	2 46	2 51	2 56	3 0	3 5	3 9	3 14
50	2 29	2 33	2 37	2 41	2 45	2 50	2 54	2 59	3 3	3 7	3 12
19 0	2 27	2 31	2 35	2 39	2 43	2 48	2 52	2 57	3 1	3 5	3 10
10	2 26	2 30	2 34	2 38	2 42	2 47	2 51	2 56	3 0	3 4	3 9
20	2 25	2 29	2 33	2 37	2 41	2 45	2 49	2 54	2 58	3 2	3 7
30	2 24	2 28	2 32	2 36	2 40	2 44	2 48	2 53	2 57	3 1	3 6
40	2 22	2 26	2 30	2 34	2 38	2 42	2 46	2 51	2 55	2 59	3 4
50	2 21	2 25	2 29	2 33	2 37	2 41	2 45	2 49	2 53	2 57	3 2
20 0	2 19	2 23	2 27	2 31	2 35	2 39	2 43	2 47	2 51	2 55	3 0

ASTRONOMICAL REFRACTION.

Apparent Altitude.	Height of the Barometer (inches) diminished by one-tenth of the Thermometer (degrees Fahr.).										
	20	21	22	23	24	25	26	27	28	29	30
° ′	′ ″	′ ″	′ ″	′ ″	′ ″	′ ″	′ ″	′ ″	′ ″	′ ″	′ ″
20 0	2 19	2 23	2 27	2 31	2 35	2 39	2 43	2 47	2 51	2 55	3 0
10	2 18	2 22	2 26	2 30	2 34	2 38	2 42	2 46	2 50	2 54	2 59
20	2 17	2 20	2 24	2 28	2 32	2 36	2 40	2 44	2 48	2 52	2 57
30	2 16	2 19	2 23	2 27	2 31	2 35	2 39	2 43	2 47	2 51	2 56
40	2 15	2 18	2 22	2 26	2 30	2 34	2 38	2 42	2 46	2 50	2 54
50	2 13	2 16	2 20	2 24	2 28	2 32	2 36	2 40	2 44	2 48	2 52
21 0	2 12	2 15	2 19	2 23	2 27	2 31	2 35	2 39	2 43	2 47	2 51
10	2 11	2 14	2 18	2 22	2 26	2 30	2 34	2 38	2 42	2 46	2 50
20	2 10	2 13	2 17	2 21	2 25	2 29	2 33	2 37	2 41	2 45	2 49
30	2 9	2 12	2 16	2 19	2 23	2 27	2 32	2 35	2 39	2 43	2 47
40	2 8	2 11	2 15	2 18	2 22	2 26	2 30	2 33	2 37	2 41	2 45
50	2 7	2 10	2 14	2 17	2 21	2 25	2 29	2 32	2 36	2 40	2 44
22 0	2 6	2 9	2 13	2 16	2 20	2 24	2 28	2 31	2 35	2 39	2 43
10	2 4	2 7	2 11	2 14	2 18	2 22	2 26	2 29	2 33	2 37	2 41
20	2 3	2 6	2 10	2 13	2 17	2 21	2 25	2 28	2 32	2 36	2 40
30	2 3	2 6	2 10	2 13	2 16	2 20	2 23	2 27	2 31	2 35	2 39
40	2 2	2 5	2 9	2 12	2 15	2 19	2 22	2 26	2 29	2 33	2 37
50	2 1	2 4	2 8	2 11	2 14	2 18	2 21	2 25	2 28	2 32	2 36
23 0	2 0	2 3	2 7	2 10	2 13	2 17	2 20	2 24	2 27	2 31	2 35
10	1 59	2 2	2 6	2 9	2 12	2 16	2 19	2 23	2 26	2 30	2 34
20	1 58	2 1	2 5	2 8	2 11	2 15	2 18	2 22	2 25	2 29	2 33
30	1 57	2 0	2 4	2 7	2 10	2 14	2 17	2 21	2 24	2 28	2 32
40	1 56	1 59	2 3	2 6	2 9	2 13	2 16	2 20	2 23	2 27	2 31
50	1 56	1 59	2 2	2 5	2 8	2 12	2 15	2 19	2 22	2 25	2 29
24 0	1 55	1 58	2 1	2 4	2 7	2 11	2 14	2 18	2 21	2 24	2 28
10	1 54	1 57	2 0	2 3	2 6	2 10	2 13	2 17	2 20	2 23	2 27
20	1 53	1 56	1 59	2 2	2 5	2 9	2 12	2 16	2 19	2 22	2 26
30	1 52	1 55	1 58	2 1	2 4	2 8	2 11	2 15	2 18	2 21	2 25
40	1 51	1 54	1 57	2 0	2 3	2 7	2 10	2 14	2 17	2 20	2 24
50	1 50	1 53	1 56	1 59	2 2	2 6	2 9	2 13	2 16	2 19	2 23
25 0	1 49	1 52	1 55	1 58	2 1	2 5	2 8	2 12	2 15	2 18	2 22
10	1 49	1 52	1 55	1 58	2 1	2 4	2 7	2 10	2 13	2 16	2 20
20	1 48	1 51	1 54	1 57	2 0	2 3	2 6	2 9	2 12	2 15	2 19
30	1 47	1 50	1 53	1 56	1 59	2 2	2 5	2 8	2 11	2 14	2 18
40	1 46	1 49	1 52	1 55	1 58	2 1	2 4	2 7	2 10	2 13	2 17
50	1 45	1 48	1 51	1 54	1 57	2 0	2 3	2 6	2 9	2 12	2 16
26 0	1 44	1 47	1 50	1 53	1 56	1 59	2 2	2 5	2 8	2 11	2 15
10	1 43	1 46	1 49	1 52	1 55	1 58	2 1	2 4	2 7	2 10	2 14
20	1 43	1 46	1 49	1 52	1 55	1 58	2 1	2 4	2 7	2 10	2 13
30	1 42	1 45	1 48	1 51	1 54	1 57	2 0	2 3	2 6	2 9	2 12
40	1 42	1 44	1 47	1 50	1 53	1 56	1 59	2 2	2 5	2 8	2 11
50	1 41	1 43	1 46	1 49	1 52	1 55	1 58	2 1	2 4	2 7	2 10
27 0	1 40	1 42	1 45	1 48	1 51	1 54	1 57	2 0	2 3	2 6	2 9
10	1 39	1 41	1 44	1 47	1 50	1 53	1 56	1 59	2 2	2 5	2 8
20	1 39	1 41	1 44	1 47	1 50	1 53	1 56	1 59	2 2	2 5	2 8
30	1 38	1 40	1 43	1 46	1 49	1 52	1 55	1 58	2 1	2 4	2 7
40	1 37	1 39	1 42	1 45	1 48	1 51	1 54	1 57	2 0	2 3	2 6
50	1 36	1 38	1 41	1 44	1 47	1 50	1 53	1 56	1 59	2 2	2 5
28 0	1 35	1 38	1 40	1 43	1 46	1 49	1 52	1 55	1 58	2 1	2 4
10	1 35	1 37	1 40	1 43	1 46	1 49	1 52	1 54	1 57	2 0	2 3
20	1 35	1 37	1 40	1 42	1 45	1 48	1 51	1 53	1 56	1 59	2 2
30	1 34	1 36	1 39	1 41	1 44	1 47	1 50	1 52	1 55	1 58	2 1
40	1 33	1 35	1 38	1 40	1 43	1 46	1 49	1 51	1 54	1 57	2 0
50	1 33	1 35	1 38	1 40	1 43	1 46	1 49	1 51	1 54	1 57	2 0
29 0	1 32	1 34	1 37	1 39	1 42	1 45	1 48	1 50	1 53	1 56	1 59
10	1 31	1 33	1 36	1 38	1 41	1 44	1 47	1 50	1 53	1 56	1 59
20	1 31	1 33	1 36	1 38	1 41	1 44	1 47	1 49	1 52	1 55	1 58
30	1 30	1 32	1 35	1 37	1 40	1 43	1 46	1 49	1 52	1 55	1 58
40	1 29	1 31	1 34	1 36	1 39	1 42	1 45	1 48	1 51	1 54	1 57
50	1 29	1 31	1 33	1 35	1 38	1 42	1 45	1 47	1 50	1 53	1 56
30 0	1 28	1 30	1 32	1 34	1 37	1 41	1 44	1 46	1 49	1 52	1 55

ASTRONOMICAL REFRACTION.

Apparent Altitude.	Height of the Barometer (inches) diminished by one-tenth of the Thermometer (degrees Fahr.).										
	20	21	22	23	24	25	26	27	28	29	30
°	′ ″	′ ″	′ ″	′ ″	′ ″	′ ″	′ ″	′ ″	′ ″	′ ″	′ ″
30	1 28	1 30	1 32	1 34	1 37	1 41	1 44	1 46	1 49	1 52	1 55
31	1 25	1 27	1 29	1 31	1 34	1 37	1 40	1 42	1 45	1 48	1 50
32	1 22	1 24	1 26	1 28	1 30	1 33	1 36	1 38	1 40	1 43	1 45
33	1 19	1 21	1 23	1 25	1 27	1 30	1 32	1 34	1 36	1 39	1 41
34	1 16	1 18	1 20	1 22	1 24	1 26	1 28	1 30	1 32	1 35	1 37
35	1 13	1 15	1 17	1 19	1 21	1 23	1 25	1 27	1 29	1 31	1 34
36	1 10	1 12	1 14	1 16	1 18	1 20	1 22	1 24	1 26	1 28	1 31
37	1 7	1 9	1 11	1 13	1 15	1 17	1 19	1 21	1 23	1 25	1 27
38	1 5	1 7	1 9	1 11	1 13	1 15	1 17	1 18	1 20	1 22	1 24
39	1 3	1 5	1 6	1 8	1 10	1 12	1 14	1 15	1 17	1 19	1 21
40	1 1	1 3	1 4	1 6	1 8	1 10	1 12	1 13	1 15	1 17	1 19
41	0 59	1 1	1 2	1 4	1 5	1 7	1 9	1 10	1 12	1 14	1 16
42	0 57	0 59	1 0	1 2	1 3	1 5	1 7	1 8	1 10	1 12	1 14
43	0 55	0 57	0 58	1 0	1 1	1 3	1 5	1 6	1 7	1 9	1 11
44	0 53	0 54	0 55	0 57	0 58	1 0	1 2	1 3	1 4	1 6	1 8
45	0 51	0 52	0 53	0 55	0 56	0 58	1 0	1 1	1 2	1 4	1 6
46	0 49	0 50	0 51	0 53	0 54	0 56	0 57	0 58	0 59	1 1	1 3
47	0 47	0 48	0 49	0 51	0 52	0 54	0 55	0 56	0 57	0 59	1 1
48	0 46	0 47	0 48	0 50	0 51	0 53	0 54	0 55	0 56	0 58	1 0
49	0 45	0 46	0 47	0 48	0 49	0 51	0 52	0 53	0 54	0 56	0 58
50	0 43	0 44	0 45	0 46	0 47	0 49	0 50	0 51	0 52	0 53	0 55
51	0 41	0 42	0 43	0 44	0 45	0 47	0 48	0 49	0 50	0 51	0 53
52	0 40	0 41	0 42	0 43	0 44	0 46	0 47	0 48	0 49	0 50	0 52
53	0 39	0 40	0 41	0 42	0 43	0 44	0 45	0 46	0 47	0 48	0 50
54	0 37	0 38	0 39	0 40	0 41	0 42	0 43	0 44	0 45	0 46	0 47
55	0 36	0 37	0 38	0 39	0 40	0 41	0 42	0 43	0 44	0 45	0 46
56	0 34	0 35	0 36	0 37	0 38	0 39	0 40	0 41	0 42	0 43	0 44
57	0 33	0 34	0 35	0 36	0 37	0 38	0 39	0 40	0 41	0 42	0 43
58	0 32	0 33	0 33	0 34	0 35	0 36	0 37	0 38	0 39	0 40	0 41
59	0 31	0 32	0 32	0 33	0 34	0 35	0 36	0 37	0 38	0 39	0 40
60	0 30	0 30	0 31	0 32	0 33	0 34	0 34	0 35	0 36	0 37	0 38
61	0 28	0 28	0 29	0 30	0 31	0 32	0 32	0 33	0 34	0 35	0 36
62	0 27	0 27	0 28	0 29	0 30	0 31	0 31	0 32	0 33	0 34	0 35
63	0 26	0 26	0 27	0 28	0 29	0 30	0 30	0 31	0 32	0 33	0 34
64	0 25	0 25	0 26	0 26	0 27	0 28	0 29	0 29	0 30	0 31	0 32
65	0 24	0 24	0 25	0 25	0 26	0 27	0 28	0 28	0 29	0 29	0 30
66	0 23	0 23	0 24	0 24	0 25	0 26	0 27	0 27	0 28	0 28	0 29
67	0 22	0 22	0 23	0 23	0 24	0 25	0 26	0 26	0 27	0 27	0 28
68	0 21	0 21	0 22	0 22	0 23	0 24	0 25	0 25	0 26	0 26	0 27
69	0 20	0 20	0 21	0 21	0 21	0 22	0 23	0 23	0 24	0 24	0 25
70	0 19	0 19	0 20	0 20	0 20	0 21	0 22	0 22	0 23	0 23	0 24
71	0 18	0 18	0 19	0 19	0 19	0 20	0 21	0 21	0 22	0 22	0 23
72	0 17	0 17	0 18	0 18	0 18	0 19	0 19	0 20	0 20	0 20	0 21
73	0 16	0 16	0 17	0 17	0 17	0 18	0 18	0 19	0 19	0 19	0 20
74	0 15	0 15	0 16	0 16	0 16	0 17	0 17	0 18	0 18	0 18	0 19
75	0 14	0 14	0 15	0 15	0 15	0 16	0 16	0 17	0 17	0 17	0 18
76	0 13	0 13	0 14	0 14	0 14	0 15	0 15	0 16	0 16	0 16	0 17
77	0 12	0 12	0 12	0 12	0 12	0 13	0 13	0 14	0 14	0 14	0 15
78	0 11	0 11	0 11	0 11	0 11	0 12	0 12	0 13	0 13	0 13	0 13
79	0 10	0 10	0 10	0 10	0 10	0 11	0 11	0 12	0 12	0 12	0 12
80	0 9	0 9	0 9	0 9	0 9	0 10	0 10	0 11	0 11	0 11	0 11
81	0 8	0 8	0 8	0 8	0 8	0 9	0 9	0 10	0 10	0 10	0 10
82	0 7	0 7	0 7	0 7	0 7	0 8	0 8	0 9	0 9	0 9	0 9
83	0 6	0 6	0 6	0 6	0 6	0 7	0 7	0 8	0 8	0 8	0 8
84	0 5	0 5	0 5	0 5	0 5	0 6	0 6	0 7	0 7	0 7	0 7
85	0 4	0 4	0 4	0 4	0 5	0 5	0 5	0 6	0 6	0 6	0 6
86	0 4	0 4	0 4	0 4	0 4	0 4	0 4	0 4	0 4	0 4	0 4
87	0 3	0 3	0 3	0 3	0 3	0 3	0 3	0 3	0 3	0 3	0 3
88	0 2	0 2	0 2	0 2	0 2	0 2	0 2	0 2	0 2	0 2	0 2
89	0 1	0 1	0 1	0 1	0 1	0 1	0 1	0 1	0 1	0 1	0 1
90	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0

NOTES ON THE STARS.

THE following brief directions may, it is hoped, be found useful by some in enabling them to identify the stars used herein. The stars, with the addition of a few others inserted for purposes of description, will be found under their respective constellations.

The beginner should make himself familiar with the more conspicuous constellations and groups, such as the Great Bear, Cassiopeia, Orion, Square of Pegasus, the Pleiades, and others, and from these he can take directions and measurements so as to become acquainted with the less conspicuous heavenly bodies and configurations.

Andromeda: α Andromedæ or Alpheratz.

A line drawn from Polaris through β Cassiopeiæ and produced to the same distance beyond points to Alpheratz. This star is sometimes called δ Pegasi, and forms the north-eastern corner of the well-known and conspicuous Square of Pegasus.

γ Andromedæ or Alamak.

This is one of the three principal stars in Andromeda, viz., Alpheratz, β Andromedæ, and Alamak. They are situated on the line which extends east and north from Alpheratz, and their position is determined by the line joining α Pegasi (Markab) and Alpheratz produced to the eastward.

Aquila: α Aquilæ or Altair.

A line drawn from Polaris midway between Deneb and Vega, and produced to an equal distance beyond them, passes through Altair, a bright star between two small ones (γ and β Aquilæ), the three lying in the direction of Vega. Altair, Deneb, and Vega form a very large and conspicuous triangle.

Argo: α Argûs or Canopus.

A line drawn from Bellatrix between Rigel and the most northern star of Orion's Belt nearly strikes Canopus.

β Argûs lies almost midway between Canopus and α Crucis, but a little nearer the South Pole.

γ Argûs lies to the west of β Argûs, and is one of five stars nearly in a straight line. It is about as far to the north of β Argûs as the latter is from the South Pole.

ϵ Argûs lies midway between β and γ Argûs.

Aries: α Arietis or Hamel.

About 20° due south of Alamak is a conspicuous star group composed of Hamel and β and γ Arietis. Hamel forms a large isosceles triangle with β Andromedæ and Alamak, and is readily visible. A line drawn from Betelguese through Aldebaran passes at 30° distance through it.

Auriga: α Aurigæ or Capella.

A line drawn from Polaris at right angles to the line of the Pointers (α and β Ursæ Majoris) and away from the Great Bear, passes at 45° distance through the bright yellow star Capella, which may be instantly recognised.

Boötes: α Boötis or Arcturus.

The curve formed by the three stars in the Tail of the Great Bear, when continued, passes through the ruddy star Arcturus.

A line from Polaris through the last star (η) in the Tail of the Great Bear passes at 30° beyond η through Arcturus.

Likewise, the line joining Procyon and Regulus, when extended to the eastward, passes through that star. Arcturus, Spica, and the bright star β Leonis form an equilateral triangle.

Canis Major: α Canis Majoris or Sirius.

A line drawn from Aldebaran through the Belt of Orion passes at about 20° on the other side through Sirius, the brightest star in the heavens. Sirius, Orion's Belt, Aldebaran, and the Pleiades are situated at about equal intervals along the same line. Sirius, Betelguese, Rigel, and Aldebaran form a magnificent trapezium with Orion's Belt in the centre.

Capella, Castor, Pollux, Procyon, and Sirius all lie on one great curve.

β Canis Majoris or Mirzam lies close to Sirius and on the same side of Sirius as Rigel.

ϵ and δ Canis Majoris lie to the south of Sirius about twice the distance of β from Sirius, δ being nearer to Sirius than ϵ (Adara).

Canis Minor: α Canis Minoris or Procyon.

A line drawn from the Twins (Castor and Pollux) to Sirius is almost bisected by Procyon, which lies 25° due south of the midpoint between Castor and Pollux.

Sirius, α Orionis, and Procyon form an equilateral triangle with sides of about 25°, Procyon being at the eastern angle.

Cassiopeia:

This constellation is situated on the opposite side of the Pole to the Plough, and at about the same distance from the Pole as the Pointers. Its characteristic feature is the W-shaped group contained within it.

α Cassiopeiæ or Schedir is the second star of the W, reckoning from right to left.

γ Cassiopeiæ is the centre star of the W.

Reading from right to left the stars of the W come in the order $\beta\ \alpha\ \gamma\ \delta\ \epsilon$, which may be remembered by the word *Bagde*.

Centaurus:

α and β Centauri lie not far from the Southern Cross. When the Cross is on the meridian, they are situated to its left, and point towards it. They are known as the Southern Cross "Pointers," β being the nearer of the two to the constellation Crux.

The constellations Centaurus and Crux lie close together and form one of the most remarkable groups in the southern hemisphere. No difficulty is experienced in identifying them.

θ Centauri, a solitary star, lies due south of Arcturus, and forms a right-angled triangle with Spica and α Libræ. A line drawn from ϵ Virginis through Spica, and produced rather more than its own length, passes close to it.

Cetus: β Ceti.

A line drawn from Aldebaran through α Ceti (Menkar) passes near four stars in Cetus, viz., γ, δ, o, ζ, and continued as far again, terminates near β Ceti, the brightest star of the constellation.

The eastern side of the Square of Pegasus when extended to the south, passes 10° to the west of it.

Corona: α Coronæ or Alphecca.

A line drawn from δ of the Great Bear through the last star in the Tail of the Great Bear, points to Alphecca, the brightest star of an almost perfect semi-circular group called the Northern Crown. It is situated at one-third of the distance from Arcturus to Vega.

Crux: α, β, and γ Crucis.

The constellation Crux, or the Southern Cross, is about as far from the South Pole as the Great Bear is from the North Pole. When the Cross is seen erect, α represents the foot, γ the head, and the cross beam is represented by δ and β, β being the nearer to the bright stars α and β Centauri.

Cygnus: α Cygni or Deneb.

A line drawn from the Twins (Castor and Pollux) through Polaris and extended an equal distance on the other side of the Pole, passes through Deneb. It lies about 23° to the east of Vega, and about the same distance as this star from Polaris. The constellation is easily recognised by the cross that marks it, Deneb being at the top.

γ Cygni marks the intersection of the cross bar with the main piece of the cross. It is the centre of what sailors call the "Kite."

Eridanus: α Eridani or Achernar.

This is a bright star lying midway between Fomalhaut and Canopus.

The constellation, which is long and winding, extending as it does from 5° S. to 60° S., lies to the south of Taurus, in the space between Cetus and Orion.

Gemini: α Geminorum or Castor, β Geminorum or Pollux.

The Twins (Castor and Pollux) lie nearly midway between the Great Bear and Orion, and are about $4\frac{1}{2}$° apart. A line drawn from Polaris to Procyon passes through them; also a line drawn from Rigel through the middle of Orion's Belt strikes them.

Pollux, the brighter of the two, is farther from Polaris than Castor.

γ Geminorum or Alhena lies about midway between Pollux and Betelguese.

Castor, Pollux, and γ Geminorum form a right-angled triangle, with the right angle at Pollux.

Grus: α Gruis.

A line drawn from α Centauri to Fomalhaut passes near α Gruis, which is situated about midway between Fomalhaut and α Pavonis.

Leo: α Leonis or Regulus.

A line drawn from Polaris by way of the Pointers and continued about 45° in the same direction from the latter, leads a little to the east of Regulus, which is almost exactly on the Ecliptic. A line from ε Orionis (the middle star in Orion's Belt) through Procyon also passes close to it.

Regulus is placed towards the end of a group of stars shaped like a sickle, and has for its "Pointers" δ and γ Ursæ Majoris.

Lyra: α Lyræ or Vega.

A line drawn from Polaris at right angles to the line of the Pointers, and on the same side as the Great Bear, passes through Vega, which is about the same distance as Capella from Polaris.

A line drawn from Capella midway between Polaris and the well-known W-shaped constellation Cassiopeia and extended to rather more than an equal distance on the opposite side of Polaris, also passes close to it.

Vega has two small stars in close proximity, the three forming an equilateral triangle.

Ophiuchus: (or Serpentarius).

α Ophiuchi (or Ras-al-Hague, as it is sometimes called) lies midway between Vega and Antares, and close to the bright star α Herculis. α Ophiuchi, Vega, and Altair form a nearly equilateral triangle.

Orion: α Orionis or Betelguese.

This bright star lies at no great distance to the north of the Belt of Orion.

Betelguese and κ Orionis form the left or eastern side of the great quadrilateral, Betelguese being the northernmost.

β Orionis or Rigel.

This fine white star lies to the south of the Belt of Orion, being balanced by Betelguese on the other side.

A line drawn from Polaris through Capella touches Rigel; also a line drawn from Castor through the middle star in Orion's Belt leads directly to it.

γ Orionis or Bellatrix.

A line drawn from the cluster of the Pleiades past Aldebaran leads directly to Bellatrix, a star in the left shoulder of Orion.

Rigel and Bellatrix form the right side of the great quadrilateral, Rigel being the southernmost.

ε Orionis or Alnilam is the middle of the three stars forming the Belt of Orion.

ζ Orionis is the southernmost of the three stars forming the Belt of Orion.

Pavo: α Pavonis.

A line drawn from α Centauri to Fomalhaut passes near α Pavonis, which is about twice as far from α Centauri as the latter is from α Crucis.

Perseus: α Persei or Mirfak.

This star, which is the central one of a row of stars formed like a bow or arc, lies in a line with Castor and Capella, and is situated above the well-known cluster of the Pleiades. A line drawn from Polaris midway between Capella and the well-known W-shaped constellation Cassiopeia leads to it, or it may be found by continuing the line of the three principal stars in the constellation Andromeda.

Piscis Australis: α Piscis Australis or Fomalhaut.

A line drawn from β to α Pegasi, the two stars which form the western side of the great Square of Pegasus, and produced about three times the distance, passes near Fomalhaut.

Sagittarius:

ϵ Sagittarii is about 10° nearer the South Pole than Antares, and forms a right-angled triangle with that star and Altair, the right angle being at ϵ Sagittarii.

Scorpio (or Scorpius): α Scorpii or Antares.

A line drawn from Regulus through Spica passes at 45° distance through the fiery red star, Antares, a star which is almost as far beyond Spica as Spica is beyond Regulus.

Antares, Vega, and Arcturus form a large right-angled triangle, with the right angle at Arcturus.

θ and λ Scorpii lie a short distance to the south-east of Antares in the Tail of the Scorpion and in the direction of ϵ Sagittarii.

The stars of this constellation form a conspicuous figure like a large S.

Taurus: α Tauri or Aldebaran.

About 25° to the northward of the Belt of Orion, and not far from the direction in which it points, is the V-shaped cluster of the Hyades, in which lies the red star Aldebaran. A line drawn from Polaris between Capella and Mirfak, and on the side of Capella, passes through no great star till it reaches Aldebaran.

Capella, Aldebaran, and Castor form a large isosceles triangle.

β Tauri or Nath, to the left of Aldebaran, lies at the extremity of one of the horns of the Bull (Taurus). A line drawn from Capella to Bellatrix passes close to it.

Triangulum Australe:

α Trianguli Australis lies near a line drawn from α Centauri to Fomalhaut. It is about the same distance from α Centauri as the latter is from α Crucis.

Ursa Major:

The stars comprising the well-known "Plough," which forms part of the constellation Ursa Major, are:—

α Dubhe.
β Merak.
γ Phegda.
δ Megrez.
ϵ Alioth.
ζ Mizar.
η Benetnasch.

α and β are known as the Pointers.

Ursa Minor: α Ursæ Minoris or Polaris.

A line drawn through β and α Ursæ Majoris points directly to Polaris, the well-known Pole Star. It is always to be seen in the same part of the heavens, and is the last star in a group of seven which bear some resemblance to the well-known Plough.

Virgo: α Virginis or Spica.

The curve formed by the three stars in the Tail of the Great Bear, when continued, passes first through Arcturus and then through Spica; also a line drawn from Polaris through Mizar passes, at about 70° distance, through Spica.

Arcturus, Spica, and Antares form a right-angled triangle, with the right angle at Spica.

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